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EDITORIAL.

ON ANOTHER page we publish a résumé of the information obtainable on the occurrence of tin ore in the United States. We believe that this article, by Mr. Garrison, will be found useful, in view of the general interest taken at the present time in the possibilities of a profitable tin mining industry on the North American continent.

IN ANOTHER COLUMN Mr. Bement discusses at length the important subject of coal tests, to which Mr. Rice called attention in our columns a short time ago. The present letter shows that such tests have failed in many cases, owing to the fact that sufficient pains have not been taken to secure conditions as nearly similar as possible in comparative trials. Some observers have relied too much upon analysis, others upon boiler construction, and others again upon points of minor importance. A complete test cannot be made without attention to all the conditions, whatever their relative bearing may be upon the results. The subject is one of very great importance to consumers, and we hope that it will be thoroughly discussed in our columns.

UNDER 'CORRESPONDENCE' we publish a letter with the tone of which we cordially disagree. The idea that mining journals are unfitted to discuss labor problems, and that mining engineers are the hirelings of one side in the great economic struggle to exist, is scarcely worthy of refutation. The engineer is no more to be charged with devoting his life to enriching men already rich than the physician is to be debited with prolonging the lives of unworthy men, the architect with building lordly dwellings for them to occupy, or the lawyer with aiding them to protect the property which they own. "Degrees in manhood" are not conferred by men of narrow opinions, nor are labor troubles likely to be settled by any man's fiat. On the contrary, the gentleman who expresses the views of himself and a few others must permit an organ of public opinion, more particularly professional opinion, to remain free to discuss this and other questions vital to the well-being of the industry which it serves, even if occasionally it treads on the toes of individuals and elicits an occasional protest, such

as that of the correspondent who signs himself "Pete Swanson."

THE TRADING IN pig iron warrants seems to be more seriously taken in Great Britain than it is here, and is commented upon as a new departure which is likely to be of considerable importance. The iron trade papers indeed hint that one object of the movement is to facilitate international trading in raw iron, and they anticipate that this business may reach considerable dimensions. In some quarters this is regarded as encouraging, in view of a possible demand here for foreign iron, as the British iron trade has been rather falling off recently. On this side, however, it seems hardly possible that we shall have any such demand as existed a year or so ago, when it was impossible for our own furnaces to supply all that was needed in time. The present capacity is so great, however, that purchases abroad on a large scale seem hardly probable.

THE MOVEMENT for the untaxed use of 'denaturized' alcohol grows apace; incidentally, it affords an opportunity for aiding other departments of commerce, in a way that will react in stimulating mining and metallurgy. An American committee of manufacturers calls our attention to some proposed legislation. The committee includes such responsible names as that of Dr. H. Schweitzer, secretary of the American Section of the Society of Chemical Industry; Mr. C. T. Hughes, of the General Electric Company, and others of equal standing. The proposed legislation is embodied in Congressional House bill, No. 93102, introduced by Mr. Boutelle. It would be difficult to estimate the reflex stimulus which would result from the Government's encouragement of the production and use of a cheap alcohol suitable for the scientific manufacture of drugs, essences, perfumes, dyes, varnishes, etc. That man is rewarded who finds a new market for a metal. Here is a chance for mutual assistance. We urge all to work, with the chemist, for such legislation as shall result in giving the cheap and efficient solvent demanded by present manufacture. It means better standing with foreign competition; it means the development of many related industries.

WE NOTE that Mr. J. H. Fawcett has resigned as mining engineer to the notorious Etruscan Copper Estates, Ltd., the reason stated being his refusal to endorse the reports and estimates given out by his directors. This unfortunate mining enterprise has been marked by several episodes, some of which have been lightened by the touch of humor, while most of them have been darkened by promises unfulfilled and an evident disregard of facts; there comes something of dignity now in this resignation of an engineer whose previous record warrants the belief that he is right in his opinions, and professional in his method of giving expression to them. Mr. Fawcett at one time was in the employ of the Broken Hill Proprietary, and more recently he did exploratory work in Australia. In risking enmity by the refusal to endorse estimates of ore which he believed to be exaggerated, and in adopting the strong course of resigning his position, Mr. Fawcett has set a good example; he merits—and he will receive—the cordial endorsement and support of all those who believe that such professional rectitude is the sole safeguard of the investing public.

THE IMPROVEMENT IN the iron trade has come rather late in the year, so far as the supply of ore is concerned. The consequence is that a degree of activity now exists in the Lake Superior district which for many years has not been witnessed so late in the season. Every effort is being made to rush ore down the lakes as fast as possible before navigation closes, in order to meet the expected demand. Fortunately, the season up to the present time has been very mild, and there is every prospect of a late closing of the Sault. This activity is a sign of actual demand, since the shipment of ore, while freezing weather exists, involves additional difficulty and expense. This is especially the case with Mesabi ores, which are apt to clog badly in the cars and in the dock pockets, and no machine yet devised is able to meet this condition. The result is that the mines on nearly all the ranges will exhaust their stock-piles and that the shipping docks will be bare of ore when the last boat leaves. Probably a few mines on the Menominee will have from 25,000 to 50,000 tons on hand, and there will be small stocks at some points on the Marquette. Possibly one or two mines on the Vermilion may have some ore on hand, but on the Mesabi the stock-piles generally will be cleaned out. The present boom will take off some piles which have been on hand for years. Thus, for instance, at the Cloquet, on the Mesabi range, a stock-pile which has been lying since 1896 is gone; and other mines which have had ore on hand for nearly as long are now bare of their accumulations. The rush for ore has also put up prices to outside furnaces, and offers of 50 cents a ton over the season quotations have been made. The movement has also started up the trade for next season at an unusually early date, and it is said that several contracts for 1905 have already been made. One probable result also will be that more winter work than usual will be done this year.

IT IS EVIDENT that in an economic sense the importation of Chinese on the Rand is a distinct success. They have taken to underground work with an excellent spirit, they are becoming efficient drillers, and they appear to like their new conditions of life. John Chinaman's contentment at Johannesburg is reflected by the cheerfulness of John Bull's stock exchange in London. The man of action has scored at the expense of the doctrinaire, the *Economist* has proved a better prophet than the *Spectator*. Indeed, the obstinate opposition of the thoughtful, well-intentioned, philanthropic and patriotic people represented by a journal so noble in its literary and ethical standards as is the *Spectator* has been proved unreasonable and ill-founded. Theories, however beautiful, are apt to be killed by facts, however ugly. Indenture of Chinamen may smack of serfdom to an idealist, but the conditions under which the coolies work at Johannesburg represent a seventh heaven of comfort when compared to the squalid tyranny under which they have previously existed in their own country. Serfdom and slavery are scarecrow words; the abject poor of East London are not so well off as the Chinamen on the Rand; the "people of the abyss" in New York City are less comfortably housed, fed and protected; and as to freedom, the most advanced conception of it is "the unlimited right of the majority to rule." The restriction of liberty either to stay in the compound or to depart from the country, is no greater hardship to a Chinaman than the inability to live at home is to the average white man who is domiciled in foreign parts. The despotism of usage and the bonds of political restraint lie no less heavily on the Occidental workman than indenture on the Oriental coolie. We congratulate our professional friends in South Africa on the outcome of the big experiment.

HONEST CRITICISM.

On another page we reproduce a friendly criticism of so big a matter as South African financial methods by our friend Mr. Curle. It is worthy of the *Economist*, a paper which Herbert Spencer at one time served as subeditor, not because this criticism is marked by any brilliancy of style or philosophic acumen, but by reason of an even rarer quality, that unswerving, outspoken sincerity which, for instance, characterizes the autobiography of Spencer himself to a degree unequalled in literature. We are strongly of the opinion that sincerity of expression in regard to human affairs is of more practical value than either philosophic profundity or rhetorical finish of writing. In this regard Mr. Curle has won a reputation which we would like to see cordially envied by the younger men connected with mining affairs; what Curle says in private he either has said in print already, or he will say in print to-morrow; there is no inside information to be given explaining away anything said—or to be said—publicly. Such treatment of mining matters may occasionally ruffle the pompous and irritate those whose plans are obstructed thereby; but, making all allowance for errors of fact or of inference inseparable from a subject so vast as the gold mining of the world, we do not hesitate to say that Mr. Curle's writings make for good, especially for a sane view of things, such as is the great requisite of a sound mining business. There is such a

dreary lot of writing and publishing of information and opinions, which are as vain as plowing the sand, simply because they are vitiated by outright falsity, or that perversion of fact which comes from "talking through one's hat" in an effort to make things appear as self-interest would have them be. The journalistic side of mining finance would be far different from the slimy morass which it is, were there a larger number of men who, by training, financial independence and force of character, were able to keep alongside of facts, without fear or favor.

SECRET RESERVES.

London and Kalgoorlie are perturbed at the present time over the right and wrong of a practice which in different forms is familiar to mine managers elsewhere; we refer to the maintenance of a reserve intended to equalize a variable output. This question was discussed in our issue of May 12, 1904, by Mr. F. H. Bathurst, of the Melbourne *Argus;* but that well-known authority on mining matters dealt with the problem in its more local aspects, as exemplified by companies operating in Victoria. However, the principle involved is the same. The importance of it from a financial standpoint has been emphasized by the Boulder Perseverance fiasco, an inquiry into which has elicited the fact that a reserve of 20,000 oz. of gold—say, $400,000—was held at the mine; from this store of unreported bullion it was the custom to take three or four thousand ounces at a time in order to increase the monthly returns when these fell off. In 1903 the actual output of the mine was 209,206 oz., but the output declared was 219,923 oz. In January, 1904, the actual output was 12,426 oz., but 17,471 oz. was stated to be the production of the mine for that month. In the first three months the secret reserve of bullion was depleted to the extent of 10,000 oz. During the first six months of the current year it became manifest that the mine could not maintain a rate of output based upon a certain estimate of ore reserves; but the gradual falling off was obscured by doctoring the returns in the manner described until finally, the secret reserve being exhausted, the facts had to come out, and there was a collapse, as injurious to the professional men connected with the management as it was distressing to shareholders who had bought stock at a price based upon a fictitious production. In the course of an official inquiry, the statement was made that the Oroya-Brownhill, a great gold mine, thoroughly well managed, gave out monthly returns so uniform in their amount that the services of a secret reserve were manifest. It was also stated that this practice was usual in Western Australia.

Before proceeding further, let it be emphasized that Western Australia is not the one corrupt spot in the mining world; it has had several unsavory scandals, and it has been the victim of a number of unscrupulous campaigns, waged both on the bear and the bull side of the market. This is due not to any inherent Westralian depravity, but, as is obvious to men of experience, to the unusual richness of the orebodies, a richness which in nature is concomitant with irregularity of occurrence. As against these troubles, so hurtful to the advance of mining as a legitimate business, must be placed a big credit for honest management, technical skill and unremitting energy, on the part of a handful of technical men, both English and American, without whom the Westralian mining companies would have been in a bad way indeed. In brief, human nature being the same the world over, mines characterized by rich and erratic orebodies afford the maximum of temptation to wrong-doing.

A fluctuating output and a secret reserve represent a state of equilibrium comparable to a powder magazine enclosing a small boy armed with fireworks. We are aware that the gold is not necessarily held in a vault; it is the custom to realize upon it and to carry a balance at the bank, transfers from which effect the purpose of regulating the returns as reported; but even though burglary of bullion is not involved, a theft no less vital is always on the cards—the loss of one man's reputation or another's property as expressed in share values. Take the case in point, the absentee manager of the Boulder Perseverance has had to suffer from statements of output which—explain it as you will—were false. To go further, the management of the Oroya-Brownhill is, we believe, operating that mine with a view to serving existing shareholders; and if a reserve is kept, it is for the purpose of avoiding such fluctuations as render shareholders anxious. It is more than likely, however, that in this case the possession of certain stopes of extraordinary richness renders it unnecessary to store bullion in the safe or to carry a corresponding balance at the bankers. In any case, a remedy for variation in the yield can be secured by methods less dangerous. In these company matters, publicity is the best preventative of wrong; secrecy is its incubator. State your output, whatever it may be; if you have a block of ground unusually rich, say so; if you carry a reserve of bullion, state that fact; publish the amount of special ore which may have been stoped during the month or the quantity of bullion transferred from the reserve in order to sweeten the returns. In short, have your reserve, but get rid of secrecy; maintain a steady output, but state how it is done. If not, cease monthly reports, which disturb timid shareholders by reason of their fluctuation, and issue half-yearly reports with interim records of progress. Surely silence is better than falsehood. A policy of straightforward frankness, accompanied by the fullest publicity, is the only cure for the present condition of affairs at Kalgoorlie; it is as necessary as fresh air to an invalid.

COPPER.

The recent advances in copper, and the apparent large demand on which they are based, have attracted general attention. In view of this, we have prepared the following table, which shows approximately the supplies of metal in the United States for the ten months ending with October and their disposition. The figures given are in long tons:

	Long tons.
Stocks on hand, January 1	64,690
Net imports, deducting re-exports of foreign material	65,951
Estimated production, 10 months	281,976
Total supplies, 10 months	412,617
Exports, 10 months	209,863
Estimated consumption, 10 months	144,625
Total deductions, 10 months	354,488
Stocks, November 1	58,129

The production this year will show, according to the accounts received from all the important districts, a gain of at least 10 per cent over last year. This increase is chiefly from the Lake Superior district, from Arizona and from Utah; though other copper mining regions have contributed to a smaller extent. The stocks given above are those reported in our issue of January 7 last, as we have seen no occasion to revise the figures then given. The imports are the net quantity remaining after deducting re-exports of foreign material. These and the exports are from the reports of the Bureau of Statistics, only the figures for the month of November being estimated.

The difficult point, of course, is the estimate of consumption. There is no doubt that, in the earlier months of the year, there was a reduction of fully one-third from the large quantities required by manufacturers in the first part of 1903. In recent months, however, there has been a marked increase in demand. Making all allowances for changing conditions during the year, we believe that the figure given is not far from the mark; if it errs at all, it is on the conservative side.

With regard to the stocks reported, it must not be supposed that these are composed of copper ready for delivery. Production is reported from the mines and smelters, where the metal is in the form of matte, black copper or converter bars; it has still to be refined and put into condition for the market. The time occupied in transportation from the mines, in refining, etc., is in most cases 60 days or more, and during this time the copper necessarily appears as in stock. The quantity now reported is, therefore, metal in process of treatment or in transportation, and cannot well be reduced below the figures given. This estimate is supported by the well-known fact that it is impossible at the present time to obtain any large quantities for immediate delivery, and we even hear of complaints about deliveries on contracts. All of the large producers are sold up, most of them for some months ahead, and there is practically no copper to spare.

These figures indicate that the present position of copper is strong. This will be emphasized when we consider further the number of

large and important electrical enterprises under construction and in contemplation, in which copper is indispensable. Apart from the conflict in the East and its special demand, there is also a large consumption in the manufacture of war material and the building of war ships by all of the leading nations. There is also an increase in the construction of machinery, in which copper and brass are required. Finally, there is the special demand for China, which has recently been evident in the market, and which promises to continue for some time to come. Heretofore this has been supplied from Japan; but even if the war in the East should end soon—of which there is no present sign—it will be some time before the Japanese mines can be again in full operation, or have copper to spare from the home needs.

There seems to be no doubt that recent advances in the metal must be held. It is quite possible, indeed, that speculation may intervene and force prices up to a point which must be followed by reaction. Such a movement, however, would be only temporary, and would not affect the underlying strength of the position.

AS THE ARTICLES on copper and on the iron trade activity on preceding pages cover those markets, we deem it unnecessary this week to include our usual editorial on 'Market Conditions.'

METALLICS.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

The cementing material in sandstones may be silicious or calcareous or ferruginous. In the cases where the carbonates of iron or lime are found, one should avoid a prolonged contact with water carrying much free carbonic acid. This may seriously injure the value and strength of the stone by dissolving out the cementing material.

Concrete may be used as a covering for brick flues and stacks. Its effect, when so applied, is to make the wall more nearly air-tight, thus greatly improving the draft. In some cases it is applied to the surface, in the form of a thick emulsion, by the air blast.

The tensile strength of steel increases with increasing temperature up to 300° C. (572° F.), and then decreases. The application of this lies in the necessity of testing, at higher temperatures, steel which is to be used for boilers, piping, and the like.

Some remarkable recalescent alloys of copper and antimony have been recently prepared by a Russian, A. A. Baikoff. The violet alloy, $SbCu_2$ melts and decomposes at 516° C., forming some $SbCu_3$, which melts at 681° C. The alloy $SbCu_3$ exists in two modifications, the α form, stable only at temperatures below 407°C.; and the β form, stable only at high temperatures. This was confirmed by thermal and micrographic studies.

RAND FINANCE.*

BY J. H. CURLE.

It is not pleasant to have to criticize adversely the actions of many of my personal friends, but it would be slurring over the real questions at issue if I tried to give an accurate description of the Rand aside from these matters. And, on the other hand, frank criticism may do good; these matters have not got out of hand yet, and by speaking out I may help to turn them into a sounder direction.

On the whole, it may be stated that the big mining houses have done good in this country. By their belief in the Rand all along, and by the very large sums they have been able to raise for its development, they have made this field the great center it has now become. In many of their troubles—and they are not free from troubles by a long way—I find myself in accord with them. In the matter of Chinese labor I agree with them entirely; in their complaint against the Government of the Transvaal for alienating large sums to assist a more than doubtful agricultural policy, I agree with them, too; and in any matter that concerns the real welfare and progress of the great industry they have built up they are entitled to a sympathetic hearing. But the capitalists are not infallible; and if they have commenced to finance their ventures in a way that does not appeal to me, I think it better to say so.

The first point is this: Before the war some of the big houses got into the way of guaranteeing blocks of shares at certain prices in many of the new flotations. These shares, for one reason or another, were not subscribed for or taken off the promoters' hands by the public, and the big houses were left with them. The guarantors then argued thus: "These mines are not going to start work yet. They have no need for all this money, which we did not stipulate was to be paid up immediately. Our guarantee is perfectly sound, and we will just pay up the money from time to time as required." To a certain extent this argument was a fair one; but let me put the argument from the other side. Even if the mines were not working, these large sums of working capital could have been put out at a good rate of interest, and have earned at least enough to pay current expenses. Independent boards of directors would have made a strong effort to get these sums paid up, but as the boards of the companies consisted of nominees of the guarantors themselves, this was not attempted. Again, third parties, consisting of smaller people financially, or the public generally, had also gone into these underwriting schemes, and had paid up their shares in full. This money, so paid up, has been a source of strength to the various companies concerned, and the big houses have, therefore, benefited through the smaller people without giving them any direct benefit in return. The sums thus involved—that is to say, guaranteed, but not yet paid up—amount to about four millions.

This sum of four millions is a big one, but only relatively so when we consider the financial strength of the firms involved in these guarantees. It would, no doubt, inconvenience—shall I say seriously inconvenience?—these firms to pay up all this money right away; but I do not for a moment doubt that their resources are equal to such a demand on them, and I make a strong appeal to them to do so. I do not believe in abusing the Rand capitalists, as some people do, and assuming they can do no right. As a matter of fact, they do many things they never receive due credit for. Even in this question I have no doubt that their contracts stipulate that the guaranteed sums are only to be paid up when required. But, then, who is to say when they are required? Certainly not their nominee boards. I say, as an observer of things on the Rand, that these sums *are* required, and at once. The big houses, although they probably don't realize it, have lost immense prestige by this system of finance, and this, to my mind, is one of the chief causes which have brought the Rand to its present state of disrepute and market stagnation. I believe a prompt reversal of this policy, and the paying up of the money, would do a great deal of good, and that it would restore to the firms the public respect which they have to some extent alienated from themselves.

There is another matter, while on the subject of the big houses and their finance, which I cannot condone at all. Some of the mines which had large paid-up working capitals have lent this money back to the controlling houses, and at probably a lower rate of interest than could have been had from any of the banks. The trouble here, again, has been that the big house appointed its nominees to the board of the company, and these nominees were forced into doing what I call a downright vicious action. This matter was raised at the last meeting of the Jupiter Company, which, I believe, is one of the mines in question. I believe, and sincerely hope, that the list of mines so involved is a short one; but if I were a shareholder in one of these mines, I would not rest till the matter was put right.

Now, I have said the worst that I know about the problems which are affecting the Rand. As I have said already, these matters have not gone too far yet, and with some exertion they can be put right. Would it not be a crying shame if they were allowed to drift as they are drifting? In time, methods like these will ruin the whole finance of the country, and play the mischief with this great industry, and with the 1,000 millions lying ready to be taken out. The Rand is much too valuable an asset to us to use merely as a medium for gambling. The capitalists themselves know this now, but so far they have not just screwed themselves to that pitch of moral courage, and temporary loss which would follow, to put right the evils that have crept in.

*Abstract from *The Economist*, London, November 12, 1904.

From recent calculation by experts of the highest standing, it appears that there is a limit to the voltage feasible in the economic transmission of electrical energy. At $50 per kilowatt-year on a 200-mile transmission, it seems that 60,000 volts has probably marked a point beyond which further increase would make a relatively small change in the cost of the transmission.

The action of copper sulphate as a catalytic carrier of oxygen has been noted frequently in technical literature. It now appears that the electrolytic oxidation of ammonia to nitrite and nitrate may be accomplished in the presence of cupric hydroxide dissolved in ammonia with sodium hydroxide as the anode bath, and sodium hydroxide as the cathode. The result is sodium nitrate, which, by the way, is produced better than the corresponding potassium and barium salts.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

CHLORINATION *vs.* CYANIDATION.

The Editor:

Sir—I have read with considerable interest Mr. Greenawalt's article in your issue of October 27, entitled 'Chlorination in Colorado,' but really the article discusses only barrel chlorination of Cripple Creek ores, leaving the various attempts to chlorinate other ores in this State, including some of Mr. Greenawalt's own efforts, to form, I hope, the subject of another equally lucid article from this gentleman's pen.

I have, at various times, expressed my conviction, based on some little experience in the treatment of Cripple Creek ores, that the cyanide process, including such modern improvements as would best lend themselves to the efficient treatment of these ores, is by far the best method known at this time for the reduction of Cripple Creek ores. I have also ventured the assertion that barrel chlorination will soon be a thing of the past.

To these statements Mr. Greenawalt now joins issue, assuming "that the survival of chlorination is not a matter of sentiment, nor is it likely that cyanide will displace chlorination in the metallurgical treatment." Then follows the trite commonplace, "If the ore has to be roasted, chlorination is quite as cheap as cyanidation," which leads up to the climax that, "with the application of chlorine as generated by electrolysis . . . cyanide will not be able to compete with it, even on the basis of economy."

While readily admitting that the columns of a technical journal are not the place to decide this issue, yet I believe a careful examination of Mr. Greenawalt's statements and figures, while defending my opposing views, may throw further light on this very important and interesting subject; and, perhaps, set others thinking.

Mr. Greenawalt states that one of the largest chlorination mills "was built by capitalists who previously employed both processes side by side in an earlier mill." This mill was built to treat custom ore, and evidently by people of no strongly formed opinions; but was it a success with either the one process or the other? I think not. Neither was the large chlorination mill, that culminated from the experience gained in the dual process mill, an unqualified success—at least, not until after it had passed into the hands of others—and was, to a very large extent, rebuilt; consequently, these statements of Mr. Greenawalt's prove nothing, either as to the alleged merits of chlorine or the defects of cyanide, as applied in the treatment of Cripple Creek ores.

Mr. Greenawalt informs us regarding Cripple Creek ores, that "if the ore has to be roasted, chlorination is quite as cheap as cyanidation." The cost of the chemicals used in the chlorination process, according to Mr. Greenawalt's own statement, amounts to 85c. per ton of ore treated; the cost of chemicals to cyanide the same roasted ore would not exceed 30c. per ton, and with skillful work might not exceed 25c.; so it is difficult to conceive how it is possible to agitate a 10-ton charge in an expensive lead-lined barrel, using 85c. worth of chemicals per ton, as cheaply as, say, a 400-ton charge can be treated—without agitation—in an open wood or iron tank using at most not over 30c. worth of chemicals per ton of ore. Mr. Greenawalt makes no estimate for refining, melting and selling the gold bars, the expense of which does not differ materially in either process, but is nevertheless part of the total cost.

Now a word as to chlorine produced electrolytically: The barrel charges given by Mr. Greenawalt call for practically five pounds of chlorine for each ton of ore treated; one pound of cyanide, costing 20c., will do the same work, showing, I think, quite clearly that barrel chlorination is both wasteful and extravagant; however, we have the important ratio established—one pound of cyanide equals five pounds of chlorine—and hence chlorine must be produced electrolytically for 4c. per pound at the barrels to equal cyanide in cheapness, and would even then have to be used in open tanks in the form of chlorine water to approach the working cost of cyanide. As chlorine at 4c. per pound is beyond the bounds of present possibilities, Mr. Greenawalt's entire claim falls to the ground.

"The total cost of treatment varies from $2.75 to $3 per ton." Before attempting to give the working cost of a process, it has been hitherto considered necessary to take into account the cost of the plant and its 'life,' as well as the usual up-keep; none of these important items appear in Mr. Greenawalt's total cost of $2.90 per ton, nor can I see in his figures any charge for taxes or insurance.

I cannot agree with Mr. Greenawalt's ingenuous assumption that the chlorination mills treating Cripple Creek ore cost nothing to erect and will last forever. One of the very latest erected is said to have cost about $800,000, and the life of that plant can not be fairly estimated at more than 20 years; money so invested should be worth 10 per cent, and sound finance would call for the refunding of the entire amount with 10 per cent interest within 20 years; this alone would add over 80c. per ton to the treatment cost at the present capacity of the works.

A so-called "mill trust" is capitalized at about $12,000,000 for a maximum capacity of, say, 250,000 tons per annum. This concern can not properly be called a trust, as it does not control either the production of the ore or the sale of the gold, nor can it ever do so. Its only resemblance to a trust is in the amount of water it has imbibed without bursting; and, lastly, it is only dangerous to competing mills in so far as the mine-owners may place themselves in its clutches by making long-time contracts; so I hold it is wrong to call such an ephemeral creation by so fierce a name, and shall content myself with the term "mill combine."

The balance sheet of the mill combine, on August 1, 1903, shows the following stock outstanding: Preferred, $3,945,800; common, $5,918,800; first mortgage bonds, $3,000,000; making a total of $12,864,600.

There is a little smelter included in the above twelve millions, and as one can be perfectly liberal in dealing with such valuations, we will assume the proportional book value of the chlorination mills is only $9,000,000; 6 per cent on which would approximately add $2 per ton to the cost of treatment. The interest of $180,000 per annum payable on the bonds would alone amount to, say, 70c. per ton of ore treated; and all this, be it remembered, without providing for refunding the actual cash cost of the work in, say, 15 years' time. The bonds, I presume, have a sinking fund to redeem them during the useful life of the works. What the works actually cost to build I have no means of determining, but I would estimate roughly that $1.50 per ton covers the interest on the bonds and the replacement of the works 15 years hence. I will not pursue this matter further, having, I believe, clearly shown that at least $0.80 to $1.50 per ton must be added to Mr. Greenawalt's total cost of barrel chlorination, even in the most recent mills—which handle practically the entire tonnage chlorinated.

A modern cyanide plant, capable of treating 150,000 tons per annum of sulpho-telluride ores, would cost in complete running order about $450,000, and the total cost of treating the ore would not exceed $2.20 per ton, including the return of the capital invested in the works, in 20 years, with 10 per cent interest on the investment.

By barrel chlorination, I mean the whole combination process as it has been developed, barrel chlorination, concentration, cyaniding the tailing (another expense overlooked by Mr. Greenawalt), and in some cases a second concentration. By cyaniding, I mean any combination process in which the use of cyanide is a leading feature. The loss of gold during treatment is not estimated as a cost against either process.

This shows what, in my opinion, cyanide can do in the treatment of Cripple Creek ores. Mr. Greenawalt's figures with my interpretation show what a new cyanide mill would have to compete against, and it is for these reasons that I have claimed the day of barrel chlorination is passing; the last mill of that sort will soon become history, and a new era of ore treatment is at hand.

PHILIP ARGALL.

Denver, Colo., Nov. 8, 1904.

TESTS OF FUEL.

The Editor:

Sir—The interesting letter of Mr. George S. Rice, appearing in your issue of October 20, does not offer a solution of any of the problems considered, but it does present some important questions; and as his letter is one of inquiry, I will offer some explanation.

The confusion in this business is caused principally because people do not understand the whole problem. The mining engineer does not always understand the analysis, and seldom knows much about the burning of the fuel. The mechanical engineer, who is supposed to know how to burn the coal, usually knows nothing of mining, and not much about analysis; and the chemist, who is the most thorough and competent worker of the three classes of men, seldom knows anything of mining or the mechanics of the burning process. The result is, that the engineer neglects or doubts the value of the chemical analysis, and the chemist is not familiar with the physics of the problem. This leads to much confusion and uncertainty, which gives expression to such views as these in the letter in question. No person who does not understand the mining, analysis and burning of the coal can arrive at a satisfactory conclusion about the value of coal, or learn why it gives different results in use. If this fact is realized and kept in mind, it should prevent conclusions being established on insufficient data. The chemical analysis is exactly what it is supposed to be; it shows what it should, but it does not give other im-

portant data, and physics plays a more important part in the problem than does chemistry.

The engineer often doubts the value of the heating power determination, which is a physical test, but as it is made in connection with the analysis, it is considered as a chemical result, and he requires a test in making steam, believing that he will get 'actual' values. His proposition for a combination of reasons is absurd.

1. The boiler can not take all of the heat out of the gases which is supplied from the fuel, and this lost heat differs on account of difference in boilers.

2. There is always more air present in the fire than necessary, and this excess varies over an enormous range, with the result that greatly varying quantities of heat are carried to the chimney by this excess of air.

3. All of the fuel is never burned, consequently some of the heat is not developed, and this quantity varies greatly.

On the other hand, the calorimeter burns all of the fuel, and also measures all of the heat generated therefrom. Not taking into consideration these facts, the engineer, basing his measurements on the amount of water evaporated per unit of fuel supply, will conclude that two lots of coal of the same heating power differ in heating effect, and ascribe to one some miraculous quality which can not be discovered by analysis. The following illustration in this connection will be of service. A certain steam plant, equipped with Hawley down-draft furnaces, had burned Illinois screenings of about 10,000 B. T. U. per pound and always made sufficient steam, but, owing to interruption of regular supply, Ohio lump coal was obtained for the occasion; its heating power was not less than 13,000, but with it there was not enough steam made to run the plant, and I was called upon to investigate the trouble. Upon arrival the engineer stated that while the coal looked all right, it was of an inferior heating quality. The facts were that in heating and all other qualities it was much superior to what had done the work before, and that the trouble was caused by its large size, because the same thickness of fuel-bed was maintained with it as had been with the screenings, with the result that an enormous excess of air flowed through the large openings between the lumps of burning coal, and this excess of air caused such a low temperature at the furnace that only a small quantity of heat could flow to the boilers, the much greater portion going to the chimney; but when the chamber above the grate was filled entirely full of coal, excess air was reduced to a minimum and steam produced in abundance.

Improper manipulation of the fire results also in incomplete combustion, causing a loss owing to heat undeveloped. The two most important evils resulting from such improper manipulation are excess of air and incomplete combustion; a third, of much less importance, is fuel loss in the ash pit.

The faults of the apparatus are, as boilers have varying efficiency, and as furnaces differ so much in efficiency, that the loss of unburned volatile matter ranges from nothing to a very large percentage of the total heat of the fuel; also, the combinations of some furnaces and grates are so proportioned and made that a large excess of air can not be avoided by the most careful manipulation, as in some forms of stoker furnaces, for example.

Therefore, great variations in results are due to the apparatus and its manipulation, with which the coal has nothing to do whatever, and poor coal burned in a good apparatus, with careful manipulation, will give much better results than a good coal improperly manipulated in a poor apparatus; yet, engineers often believe that a poor coal, under such conditions of use, has a peculiar character of greater value than shown by the calorimeter. This, however, can not be true, because an atom of carbon or hydrogen possesses nearly the same quality and heat-producing value in one coal as in another, and the energy required to break up existing combinations of elements in the fuel is exactly the same whether the coal is burned in a calorimeter or under a boiler. The temperature produced by combustion may be determined by the formula:

$$T = \frac{\text{Heat developed}}{\text{Weight of the gas} \times \text{its specific heat}}$$

and it is not correct to assume a superior temperature due to relation between carbon and volatile matter for any particular coal.

The analysis shows accurately and positively the following, among other things: The heating power of the fuel; the damage to the heat value, owing to presence of moisture and ash; the amount of the volatile matter and the volatile combustible; the quantity of ash and its fusibility. But the analysis gives no information about the following, among other things: The effect of the presence of the quantity of moisture and ash; the effect of the fusibility of the ash; how much of the volatile combustible matter may be wasted by an imperfect furnace. Neither does it give any idea whatever of the effect produced on the fire by the size of the coal, or how much of the heat will be lost on account of the low efficiency of the boiler and improper manipulation of the fire.

The analysis should give data which enables certain determinations to be made when other values are known; for example, if the temperature at which the gases leave the boiler is known, the heat loss, due to presence of moisture, may be determined. Likewise, the effect of the quantity of moisture on the purchaser's pocket-book. Also, if the effect produced by an imperfect furnace or improper manipulaton is ascertained, then this effect on the heat value which is given by the analysis may be determined.

Now, various coals do produce certain results in service, which are quite different, and these can only be determined by proper experiments. It will be useful first to present the coal in certain proportions, as follows:

Carbon + hydrogen + sulphur = combustible + oxygen + nitrogen = pure coal + ash = dry coal + moisture = moist coal. As coal is something which produces heat, and as ash and moisture do not produce heat, they can not in this sense be called coal; neither do oxygen and nitrogen produce heat. A combination of carbon, hydrogen and sulphur alone might be conceived as existing in coal, but as the moisture and the ash are readily separated by analysis, it is assumed that coal in this sense is pure coal, the heating value of which is approximately from 13,500 to 14,500 B.T.U. per pound for different localities and seams in Illinois; therefore, the heat value of the coal is as 1 is to 1.07. This is a small difference, which does not account for the great variation produced by the moist coal combination in service; therefore, as commercial coal is composed of only pure coal, ash and moisture, it must be the two latter constituents which, from the standpoint of composition, produce the difference in effect. If the moisture is first considered and taken to be 10 per cent in quantity, it appears that about 1 per cent of the heat would be lost, with an ordinarily good boiler, on account of its presence. This is a quantity so small that its effect cannot be discovered in the most careful experiment in burning coal under a boiler; therefore, it is not the moisture which makes the trouble. The chief objectionable feature of moisture is that the purchaser pays a considerable sum of money for it and gets no benefit. To the remaining constituent, the ash, therefore, the great difference in effect must be due, so far as relative composition of the fuel is concerned.

If anyone wishes to study the effect, quantity and character of ash, he may do so with great profit by experiments as follows: Provide some uniform small-sized coal, as low in ash as possible; burn it in one experiment just as it comes on a chain-grate stoker located under a boiler, and note the result. Then, with succeeding experiments, add certain increasing quantities of ash at each test, maintaining all conditions, except quantity of ash, uniform for each test. In this way positive and direct results may be obtained serving to solve one of the features of the problem which is little understood. By repeating this series of experiments with a readily fusible ash, still more striking results will be obtained. A chain-grate stoker is much the best for the purpose, because it requires no manipulation. It discharges the ash continuously and supplies the coal with mechanical exactness. Because of continuous discharge of the ash, it shows the effect of its presence at a minimum; this would be much greater with a hand-fired grate, where removal of ash is not continuous and uniform.

The size of the coal is a cause of greater difference of effect in service than any other characteristic of the fuel, yet the analysis gives no information about this feature. Its effect may readily be determined under certain conditions by experiment, as follows: Select a number of different and uniform sizes of coal, ranging from what will pass through a ¼-in. screen up to that of about 1½ in. in size. Burn each on a chain-grate stoker under a boiler, maintaining the same thickness of fire in each experiment, and with the damper full open in all cases. If it is an average good apparatus, with a fairly strong draft, the capacity produced with the different sizes will range from 0 to 12 h. p. per square foot of grate. The zero capacity will occur with the largest size, because so much air will enter between the pieces, and, consequently, the temperature will be so low that the coal will not ignite. The fire will, therefore, go out; but if the draft is reduced sufficiently by partly closing the damper, the flow of air between the pieces of the coal will be reduced to a quantity which will produce a higher temperature, and the fuel will burn. The capacity will necessarily be less with the largest size, because of lower draft, than it should be with a size of about ¾ in., with the fuel draft. Such a series of tests of size on a chain-grate shows effects at their maximum, which are at a minimum on a hand-fired grate, because, with the latter, proper manipulation will correct the influence due to size, so that each will approach much nearer a uniform result than is possible with the stoker.

Therefore, the effect of ash is at its minimum with a stoker and at its maximum with

a hand fire, and the effect of size is at its minimum with a hand fire, and at its maximum with a stoker.

Prevailing confusion of ideas is due to the fact that usually experimental methods are not sufficiently comprehensive to discover the effect of the individual features of the problem; for example, engineers burn coal under a boiler and express the result in pounds of water evaporated per pound of coal, or, as efficiency produced, to discover four different things:

1. To ascertain the heat-producing value of the fuel.
2. The efficiency of the boiler.
3. Value of the furnace.
4. Skill of the fireman.

Now, one kind of experiment cannot measure four different things. In such cases the engineer credits or charges certain results to such one of the four features as he has in mind. For example, if he is interested in the efficiency of the boiler and gets poor results, he charges it against the boiler; but if he wanted to test his fireman, he would blame the man; in this manner, one man may conclude that the coal is of poor quality, while another will determine that exactly the same coal is of good quality.

The only characteristics of the coal which the analysis and calorimeter do not show, are the effect of size, and that of the quantity and fusibility of the ash. Therefore, the only proper experiments to be made in a furnace under a boiler are those calculated to ascertain the effect of size of coal and of quantity and fusibility of the ash. It follows that it is not possible to arrive at the value of the fuel by analysis alone, nor by the results of the burning test alone; and conclusions based only on results of one kind of tests are often of as little value as the critic claims.

There are certain facts which must be realized and taken into consideration; one is, that the opinions held regarding values of different coals, or the same coal as loaded at different mines, are based on incomplete data, and for this reason are not at all conclusive. It is, of course, true that the varied published data are very much better than nothing at all; but, as a matter of fact, previous work has been in large measure only preliminary training, which has enabled us to arrive at a point where the work can again be taken up on a much better basis.

Another fact is, that boilers have been tested to a limited extent only, there having been but one conclusive test ever published showing the efficiency of one boiler as compared with another. The great number of experiments which are called boiler tests are not tests of the boiler itself, but of the combined apparatus, the fuel and its manipulation.

Regarding the practice of the engineer in basing his calculations on a dry-coal basis, he does so only when testing the boiler, and for the reason that dry coal in general is of a more uniform quality than moist coal. To test the boiler he desires, as far as possible, to obtain a uniform fuel quality, so that there may be some standard of measurement. When he tests the coal under a boiler, he assumes that the efficiency of the boiler is a standard quality, and bases his results on moist coal, because this is what he is testing.

If a prominent engineering firm obtains moisture by drying a sample on top of the boiler, such people certainly employ a very crude and inaccurate method. This is more liable, however, to give results too low than too high. The standard method is to dry the sample in an oven at 110° C., or 230° F., for one hour, a temperature higher than prevails above boilers.

Personally, I regret that, of all the work so far, criticism is made only of the recent work published by the University of Illinois, because it is, without doubt, the best work of the kind that has ever been done, certainly as far as Illinois coals are concerned. The difficulty of securing accurate samples, of which Mr. Rice makes mention, is, of course, an actual one.

The trouble is not that this matter of fuel value is treated too much from an academic standpoint, but that it is not treated altogether from such standpoint.

Improper and incomplete tests by the purchaser do, and will continue to, subject the coal producer to trouble and injustice, just as the absence of tests has caused loss and trouble to the purchaser. The community is being educated in technical work and methods, however, and the universities and colleges are sending out a larger and rapidly increasing number of young men who have their living to earn, and some of them will test the coal furnished by the producer whether he wants them to do so or not, and it is by all means desirable that future efforts be directed to proper channels. The tendency will be to represent the different coal-seams and mines at their proper relative value, and especially to draw the line between good and bad mining conditions, so far as run-of-mine coal and screenings are concerned, with the result that the best coal and the best mining conditions will receive more just consideration than at present.

A. BEMENT.

Chicago, Nov. 11, 1904.

VENTILATING A TUNNEL.

The Editor:

Sir—Referring to the question on the ventilation of a 'tunnel' or adit in your issue of November 3 and your editorial thereon: Any factory producing machine-woven bags for grain, can, by displacing a lever which starts the weaving of the bag-bottom, produce a continuous cotton pipe of about 14 in. diam., in 50-ft. or 100-ft. lengths. I have used 100-ft. lengths and of a size to be expanded by ordinary hoops taken from railroad-spike kegs. For short distances and ordinary air-pressures, the leakage through the bagging is inconsiderable, but it may be rendered air-tight by linseed oil, as you suggest. If this is done, care should be taken against spontaneous combustion, avoiding an accident such as that which occurred to me, and resulted in burning up one length of my ventilation pipe.

G. C. HEWETT.

Colorado Springs, Colo., Nov. 12, 1904.

Slag cement is made by mixing granulated and dried blast-furnace slag with lime and other ingredients, and grinding the mixture so fine that at least 95 per cent of it will pass a 200-mesh screen. The mixture may be burnt to a clinker before grinding.

It is generally held by geologists that tin veins are formed by the action of vapors. Such deposits are usually confined to granite, and it is believed that the vapors given off by the cooling of this rock have carried and deposited the tin.

PRESENT STATUS OF STEAM TURBINES.

A paper read by R. H. Rice, of the General Electric Company, at the annual meeting of the American Street Railway Association, October 12, led to a discussion which threw light on the present status of the steam turbine. The Curtis turbine, horizontal type, is made as small as 1.5 kw. The vertical type begins with 500 kw. The machines are built for condensing and non-condensing service. The speeds range from 5,000 rev. per min. in the 1.5 kw. machine to 1,800 revolutions in the 300 kw. Several machines are in use for train lighting, and some progress has been made in their application to other apparatus besides electric generators, but this problem necessitates the development of satisfactory speed-reducing apparatus. It is anticipated that this will be successfully accomplished.

Mr. C. O. Mailloux stated that he had not heard of any trouble with water carried over with the steam, but Mr. Hopkins reported an example of trouble on this account with a 500 kw. turbine at Columbus, Ohio, although superheated steam was used. Mr. W. H. Abbott stated that he had also had trouble from a deposit in the oil, like vaseline, which made it necessary occasionally to stop the turbine to clean out the oil chambers.

As to relative economy, Mr. Mailloux remarked that the evidence indicates that the turbine will make up in other things for a slight difference in steam consumption against it. Anyway, there is a certain critical price for coal at which the reciprocating engine is preferable to the steam turbine, and a slightly higher price at which the gas-engine is preferable to the reciprocating steam-engine.

Mr. J. R. Bibbins, of the Westinghouse Machine Company, said that the steam turbine is almost the ideal prime mover for maintaining a high average of plant economy under unfavorable conditions. Its high speed constitutes an important regulating force; its overload capacity is large, and its economy under fluctuating loads is exceptional. Records were presented of 46 Parsons-Westinghouse turbine plants, ranging from 400 to 40,000 kw. in capacity, with an aggregate of 143,750 kw. Working pressure ranged from 125 to 200 lb., superheat from 0° to 180°, and vacuum from 24 to 28 in. Mr. Bibbins summarized the situation in regard to the steam turbine as follows: "The facts presented seem to command respect for the turbine as a machine of wide application, rugged and permanent in construction, responsive to excessive and sudden demands, peculiarly suited for parallel operation under the most difficult circumstances, and capable of yielding commercial results under extremely unsuitable conditions. It is not, however, in the makeshift plants that the turbine can do its best work. Formerly, in many cases, the turbine has been designed to accommodate existing conditions in the plant. To-day the reverse is true. The plant is now being designed for the turbine, and the more universal this practice becomes, the more marked will be the influence of the turbine on present and future power station economics."

For the refining of gold-silver-zinc precipitate from cyanide solutions, it is recommended, instead of removing the zinc with acid, to distil it, to be collected and used over again. The retort residue, which can be poured like so much sand, is fused with litharge, and the lead is afterward cupelled, the resulting litharge also being used again.

THOMAS MESSENGER DROWN.

By R. W. RAYMOND.

The sudden death on November 17 of Dr. Drown will bring to thousands the pang of a personal loss. Of all those who, as students at Lafayette College, the Massachusetts Institute of Technology and Lehigh University, were brought under his influence, not one can have forgotten him, and all will now acknowledge, with an unfading gratitude, what they owe in professional equipment to his wise, clear, skillful guidance, and in character to his sympathetic, stimulating personality. Outside of this wide circle, the experts of both hemispheres will lament the departure of one who, in his department of scientific investigation, both knew what work was needed, and how to do it so that it needed not to be done again. The older members of the American Institute of Mining Engineers will remember with gratitude the part he took, as Secretary from 1873 to 1884, in promoting the interest of that organization, and in shaping the plan and policy which it has followed with such noteworthy success. And, in addition to all these (though partly included among them), there are a host of friends, who can scarcely think of the public loss by reason of their own.

For myself, I dare not put into words the depth and acuteness of my bereavement. I shall claim the privilege of contributing to the *Transactions* of the American Institute of Mining Engineers an account and estimate of Dr. Drown's life and work, more detailed and more accurate, though neither more nor less sorrowful and sincere, than the present brief and hurried tribute.

Thomas Messenger Drown was born at Philadelphia, Pa., March 19, 1842. Graduating from the Philadelphia High School in 1859, he entered the medical school of the University of Pennsylvania, and received in 1862 from that famous school the degree of doctor of medicine. For a brief period he practiced his profession as a physician, making during that time, I believe, one or two voyages as medical officer of an ocean steamship. But he seems to have been attracted neither by therapeutics nor by surgery; whereas chemistry, which he had studied incidentally, as part of his medical course, had a strong fascination for him; and, following this call, he definitely abandoned his practice as a physician and resumed the position of a student, taking special courses in that science at Yale and in the Lawrence Scientific School of Harvard University. After this he spent some years abroad as a student at the University of Heidelberg and the Royal Mining Academy of Freiberg, Saxony, where he devoted himself, under the great teachers of that generation, to chemistry as applied in metallurgy.

Returning to the United States thus fully equipped, with a technical preparation not to be acquired at that time in this country, he practised for some years in Philadelphia as an analytical chemist, and in 1875 accepted the professorship of chemistry at Lafayette College, Easton, Pa. In 1885 he assumed and retained for more than ten years, a similar position in the faculty of the Massachusetts Institute of Technology, at Boston. During the latter period he planned and executed what was, perhaps, the most useful and memorable achievement of his scientific career, namely, the systematic investigation (involving several thousand chemical analyses) of the spring and well waters of Massachusetts, and the preparation, on the basis of these analyses, of the famous "chloride-map" of that State, from which it can be determined at a glance how much chlorine, found by the analysis of water from a given locality, can be considered as due to the salty breezes of the Atlantic, and how much should be regarded as indicative of organic contamination.

In 1895 Dr. Drown accepted the presidency of Lehigh University, at South Bethlehem, Pa., and that position he occupied for the rest of his life, winning and deserving the love, respect and admiration of all by his executive ability, tact and wisdom.

I have reserved to the last a brief characterization of his connection with the American Institute of Mining Engineers, of which he became a member at its first meeting, in May, 1871, and secretary in 1873. As a member, he initiated and inspired the discussion of chemical methods which has been so suggestive and useful throughout the world. As secretary he fixed the scope and form of the Institute *Transactions* so wisely that I, as his only successor thus far, have been unable to do, and scarcely desirous of doing, more than maintaining, on the larger scale involved by the growth of the Institute, the standard he established.

THOMAS M. DROWN.

In June, 1879, Pardee Hall, the home of the scientific department of Lafayette College, then containing the office of the secretary, and the library and other possessions of the Institute, was destroyed by fire. The conflagration was so sudden and swift that there was not time to save all the valuable contents of the building, and a choice had to be made. Secretary Drown made that choice instantly, generously and wisely. Realizing that the library of the Institute, consisting mainly of files of technical journals and the proceedings of technical societies, received by way of exchange, could probably be replaced if lost, whereas the loss of the records of the Institute itself, and the stock of back volumes of its *Transactions* would be practically irreparable, he decided at once to save these, and let everything else go. Of course, he was surrounded by students, eager to assist in the work of salvage. But everybody knows how indiscriminate, and even ludicrous, is the aid rendered by excited individuals on such occasions; and the achievement of the secretary in that tumultuous hour was a wonderful evidence of his quiet, clear-headed executive ability. For he so directed the labors of his young assistants that they rescued from destruction just what he deemed most valuable. When that had been accomplished—and it was completely accomplished—there was no time for anything more. Not until that moment did others realize what he had known all the while, that he was deliberately saving to the Institute the invaluable records of its past, at the sacrifice of his own professional library, occupying a room in the same building. This sacrifice was to some extent made up to him through the hearty appreciation of his fellow members, which found substantial expression at a banquet held in connection with the Montreal meeting of the Institute, in September, 1879, in the presentation to the secretary of a check for several thousand dollars, contributed by a large number of his grateful colleagues.

In 1883 Dr. Drown was obliged, by the pressure of his other duties, to resign his position as secretary of the Institute, the rapidly growing responsibilities and labors of which were beyond the strength of any man already under other obligations. At the annual meeting of February, 1884, he was elected with unanimity and applause an honorary member of the Institute, a distinction which has been bestowed upon few. In 1895 he left the Massachusetts Institute of Technology to accept the presidency of Lehigh University, and in the same year Columbia University, in the city of New York, honored both itself and him by conferring upon him the honorary degree of doctor of laws. In 1897 the American Institute of Mining Engineers testified its undiminished sense of his merits and services by electing him its president.

What he achieved during the nine years of his presidency of Lehigh University cannot be told here and now. It undoubtedly involved the abandonment of his personal, professional career as a chemist, in which he had already achieved world-wide recognition. Yet who shall say that such a diffusion of his energy into the form of influence, exerted upon the rising generation, was not more illustrious and more beneficent than any further pursuit of individual ambition would have been?

Dr. Drown died from the effects of a surgical operation, which revealed the existence of a tumor, more extensive and maliguant than had been suspected.

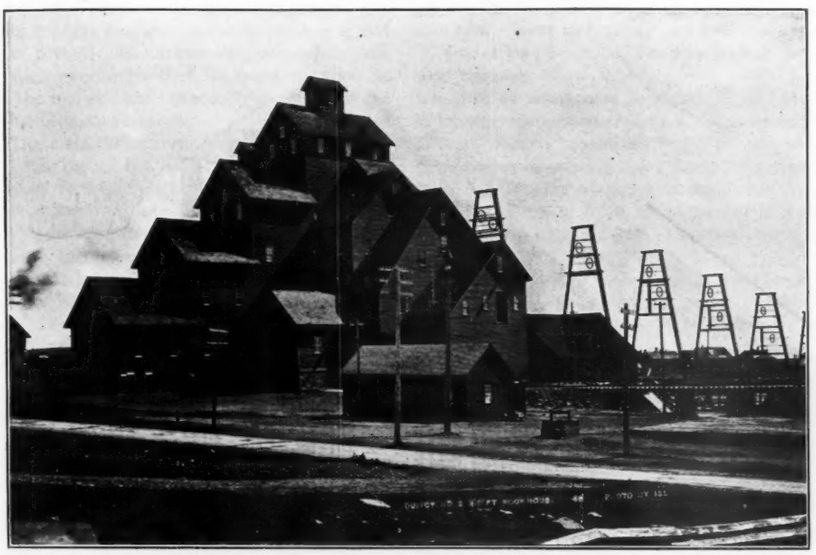
We who have so recently seen him, apparently full of health and vigor, at the meeting of the Iron & Steel Institute in this city, and on the excursion of that body to West Point, could scarcely believe that he has been so soon cut down.

In the combination of gentleness with power, candor with conviction, wide culture with special and accurate knowledge, generosity with judgment, genius with industry, sensitiveness with patience, the keen judgment with the pure heart, the power to win love with the power to command esteem, the wisdom of this world with the wisdom of the world to come, this, our dear friend, stood conspicuous among men. Would there were more like him for us to love, to admire, to imitate and gratefully to mourn!

COPPER MINES OF LAKE SUPERIOR.—VII.

By T. A. RICKARD.

Every mining region has local terms requiring definition, if they are to be understood by those living elsewhere. Underground in the Lake Superior copper mines two products are recognized, the valuable output known as 'copper-rock' and the refuse or 'waste.' The big masses of native metal are known briefly as 'mass,' the smaller pieces constitute 'barrel work,' because usually loaded into barrels; and, finally, there is the run-of-mine, or 'stamp-rock.' The particles of metal, ranging from slime to nuggets, which are extracted by milling, are collectively termed 'mineral'; according to their purity they are graded in three, four or five numbers, ranging in percentage of copper from 25 up to 72. The 'mass' and 'barrel work' will average 95 per cent copper.



QUINCY, No. 2 ROCK-HOUSE.

Mining methods in the Upper Peninsula exhibit noteworthy differences; and as these variations in practice underground are based upon diversity of conditions, they are as creditable to the technical men who apply them as they are instructive to the observer from foreign parts. Before venturing to comment or to criticise, it will be well to describe the manner in which the work of actual mining is performed in four typical instances.

One of the largest, best known and most representative mines in the Lake Superior district is the Quincy, whose tall rock-houses overlook the waterway that serves as the main highway of transport. The Quincy has seen great changes in mining methods; it is only eight years since the miners went to work underground on a 'man engine,' but that ancient abomination is now a dishonored memory and the old inclines "crooked as a ram's horn" have been replaced by straight shafts and winding engines of modern design. Capt. Samuel B. Harris, the former manager, and his son, Mr. John L. Harris, the present superintendent, have made a great many changes, by way of straightening the working shafts, putting in double skip-roads and systematizing operations generally. It certainly was high time to do something of the kind, for the shafts, as could be seen on the maps, were getting into a tangle. The two new shafts, known as No. 6 and 7, are at right angles to the strike of the lode, but the older openings were quite uncertain in their bearing; so that while the distance between shafts No. 2 and No. 6 is 1,928 ft. at surface, they are only 1,581 ft. apart at the 53rd level; in the same way No. 4 and No. 7 are only 860 ft. apart at surface, but are separated by 1,254 ft. at the 53rd level, which corresponds to a vertical depth of 3,480 feet.

The scale of operation tends constantly to increase; thus, while the skips in the old shafts held only two tons of ore and were hoisted at the rate of 500 ft. per minute, now, in the new shafts, skips carrying eight tons are brought to daylight at a speed of 3,000 ft. per minute, with a maximum of 3,500 ft. The reader will appreciate better what this means when told that the most rapid passenger elevators in the tallest buildings in New York—such as the Park Row building—travel at a speed of only 300 ft. per minute; and even at this rate of descent or ascent our country friend finds his heart in his mouth.

The shafts are 6 by 19 ft. in the clear, and the two skips work in balance—that is, one of them goes to the bottom as the other comes to surface. There is no pump, the mine making so little water that it can all be hoisted in tanks. The No. 2, 6 and 7 shafts are equipped to handle 1,400 tons each in 16 hours of actual hoisting, the remaining time (exclusive of intervals between shifts) being devoted to the lowering of men, tools and supplies.

The Quincy mine has 61 levels, reaching to a depth of exactly one mile, that is, 5,280 ft. on the dip, or 4,008 ft. vertical. The lode dips 55° at surface and flattens to 37° in the bottom workings. No. 7 shaft starts at 54° 30′ for a distance of 1,040 ft., and then curves 15′ for 740 ft.; there is a 22′ curve for the next 1,000 ft., and a 30′ curve for 675 ft., then a 45′ curve for 563 ft., so that at the 58th level this shaft is sloping at 37° and is approximately parallel to the lode, though a few feet underneath it. By carrying the shaft in the footwall—about 10 ft. underneath—it becomes safe to stope the lode in its entirety.

The skip weighs 5 tons and carries 8 tons of rock. (See Fig. 1.) It is provided with 4.5 in. by 4.5 in. angle-irons one-half inch thick, two at each end of the skip; these are 3 ft. 4 in. long and extend below the bottom of the skip, so as to serve as guides by passing in contact with the wooden runners which carry the rails. No instance of a skip "jumping the track" is known; quite recently a falling piece of rock struck a car wheel and bent the axle, but the car (or skip) was held between the rails and slid down the shaft without injury to the track or

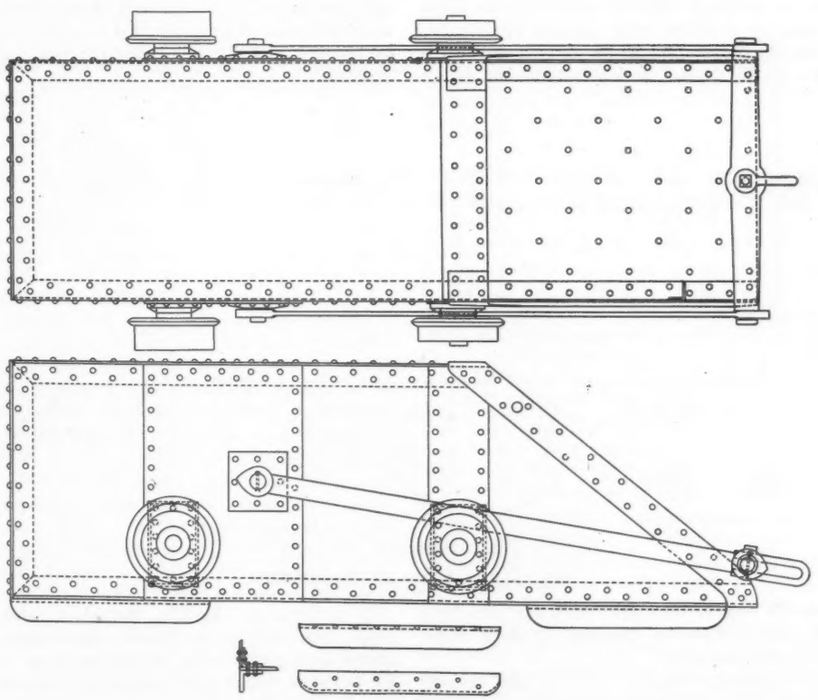


FIG. 1.—SKIP.

to anyone near it. Rails weighing 50 lb. per yard are laid in the shaft, while 35-lb. rails are used in the levels. The tram-cars used underground carry 3 tons each, and are hauled in trains of three or four cars by an electric locomotive of 15 h. p., weighing 5,500 lb. All construction is heavy and substantial. In the well-equipped machine and blacksmith shops at the mine the company makes its own skips, cars and machine-drills. In the blacksmith's shop there is a machine for shaping and sharpening the drills. A blank steel bar is instantly forged into a drill ready for work by a pneumatic hammer dropping upon it while pushed under a die.

A practice recently started in the Quincy mine is to use a cross bit (sometimes known as a 'rose bit') for starting a hole, drilling to, say, 3 ft. deep, and then to employ the plain chisel bit in finishing the hole, to the 10 or 12 ft. of total depth. When ready for use, the drills are bunched in lots of a dozen and are held tightly together by a wrought iron ring, which is kept in place by wooden wedges, on the faces of which the number of the level and the number of the contract are marked. This arrangement is preferable to the usual rope sling.

Most of the actual mining is done by contract, there being four men (two on each shift) to each contract. The two shifts, of 10 hours each, are separated by intervals of two hours, which are utilized for getting rid of smoke, due to blasting, and for ventilating the workings generally.

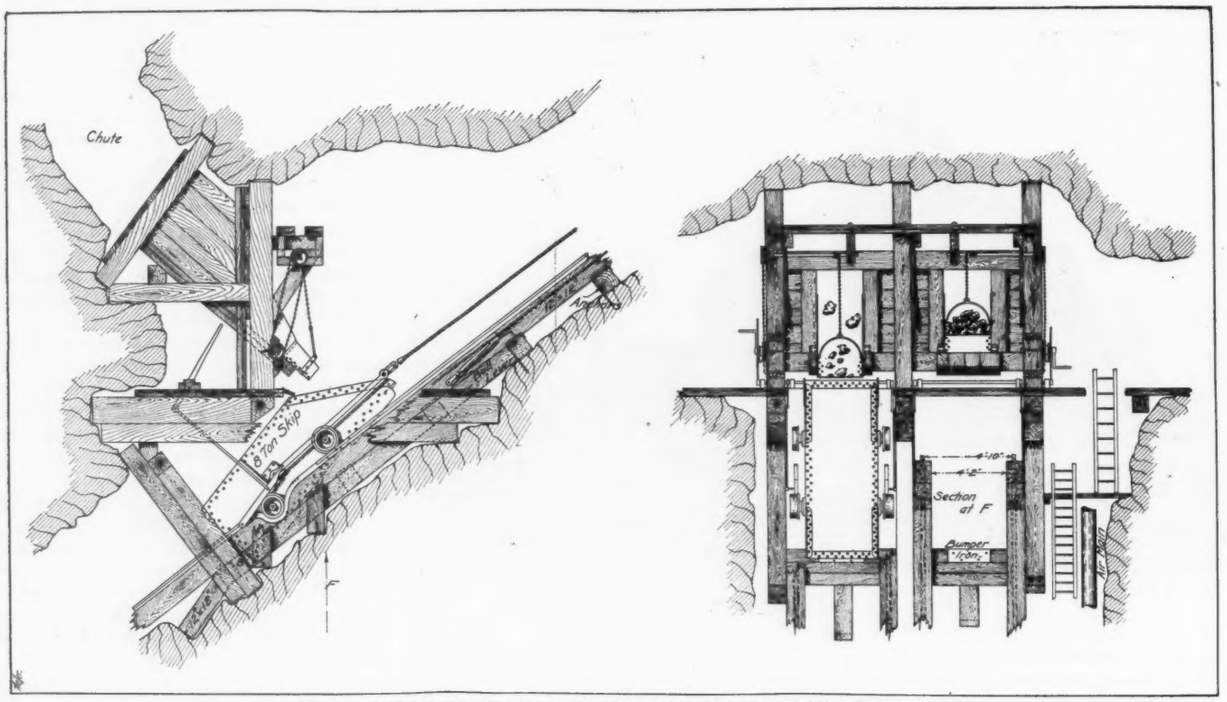


FIG. 2.—ARRANGEMENT FOR LOADING THE SKIP IN THE QUINCY MINE.

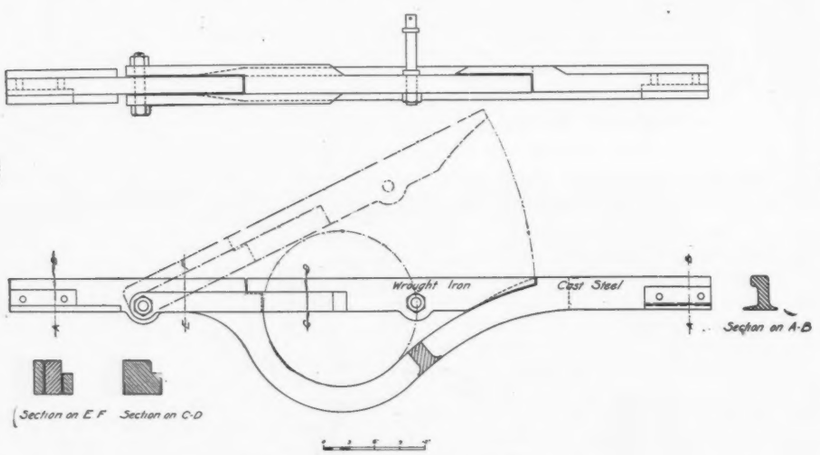


FIG. 3.—DETAIL OF TILTING DEVICE.

To prevent over-winding, there is a safety catch, which applies the brakes automatically, unless they are released by the engineer by the time the skip is within 150 ft. of the surface. When the skip is dumped, the contents fall upon a grizzly made of fixed cast iron bars capped by a removable angle-iron, the spaces between being 2.5 in. wide. The biggest of the oversize is pushed handily into a low two-wheeled truck, and is then trundled to the rock-breaker; this is an expeditious way of moving the big pieces of rock and is an advance on the usual manner of pulling them across the floor. The smaller pieces are thrown direct into the crushers. As the grizzlies are laid at a low angle, some of the small stuff rests on the bars; this is hooked to the front and then shoveled into the small crushers. There are three of these in each 'rock-house,' as the shaft-houses are termed. The Blake type of rock-breaker prevails, the biggest with 18 by 24 in. jaws, and the two smaller, each 13 by 20 inches. The unwieldy pieces of mass copper go to a drop-hammer weighing 1.5 tons and having a drop of 20 ft., so that the crushing weight is equivalent to 60 tons. Here the rock attached to copper is broken off, the larger fragments going to the crushers, while the remaining metal is lowered into cars for shipment direct to the smelter. Smaller chunks of copper, say, up to the size of a man's hat, are placed under a steam-hammer; there is one of these in each rock-house, their function also being to loosen the encasing rock so that the copper is rendered clean enough to go forthwith to the smelter.

Methods underground are worthy of detailed description, because they represent a practice which has been evolved from experience. The average stoping width is 8 ft.—ranging from 3 to 20 ft. Shafts are sunk in the footwall, and cross-cuts at each station connect them to the main levels. The nature of the hanging wall varies in different parts of the mine. The copper-bearing rock in places is separated from the overlying main plane of lode fracture by a narrow width of shaley formation, which is apt to cause trouble, and in such places the main drifts are driven well under the hanging, so as to leave a portion of copper rock to support the ground and thereby avoid exposing the shale band, which "blisters off" or scales, not so much by reason of weathering, as on account of strains brought about by the pressure of the overlying rock-mass following upon the excavation of the extensive upper workings. There are plenty of joints or cross-

fractures in the lode; these make the ground heavy in places, but they also facilitate stoping. No cross-veins or feeders of decided character are observable, except a 'spar vein,' a vein of calcite, from 3 to 15 ft. wide, which cuts across the lode without dislocating it materially. Mr. John L. Harris, the superintendent, to whom I am indebted for many courtesies, states that displacements in the lode are less frequent in the deeper levels, and that several dislocations encountered in the shallow workings—that is, down to 3,000 ft. on the incline—have gradually dwindled to the point of disappearance.

The main difficulty underground arises from the flat dip of the lode. At an angle of 37° broken rock will not descend freely. Waste rock is built up into walls, which reach from the footwall to the hanging, and, in these 'pack walls,' openings are left for the chutes or passes at intervals of 40 to 50 ft. When the lode is broken by a blast, only the big pieces roll down; the remainder is pulled and hooked down until it lands on a platform or 'sollar' on the footwall side of the level, whence it is shoveled into the cars. At each chute or 'mill-hole' the trolley line of the electric tram is protected by a piece of timber, which prevents flying pieces of rock from cutting the wire.

At each station there is an arrangement for the loading of the skip, which merits attention. It is an intelligent device for overcoming the low inclination of the shaft. A winze or pocket is cut in the hanging-wall, either in the lode, or in the overlying trap, according to local conditions at the successive levels. This pocket has an inclination which is never less than 40°, and is frequently nearly vertical, so as to allow of a free descent of the broken lode-stuff. Any one of such pockets will hold 500 tons; it will reach down to the next station and terminate close to the shaft, where there is a chute and apron, the latter having a sheet-iron spout, which is lowered when the skip is being loaded. In one instance, at the No. 2 shaft, the same pocket or winze connects between three levels, it being so arranged that dumping is practicable at both of the upper two levels—that is, tramcars can be discharged at the 55th level or the 56th so as to reach the skip at the 57th level.

The loading of the skip to its full capacity is facilitated by the tilting device, shown in Fig. 2 and 3. About 10 ft. below the floor of the station, a portion of the runner, on which rails are secured, is notched out, so as to receive a device made of semi-steel, substantially as shown in cut. This device is equipped with a tongue—about 2.5 ft. long—faced with steel, which takes the place of the rail, and is hinged so that it can be raised by a lever placed at the station. When these tongues are raised, the skip is lowered until its hind wheels drop in the tilting device. Here the skip is firmly held, tilted at an angle of 50°, until loaded from the chute, which is charged from the level above. It is then hoisted and the tongues (which have rested on the hind wheels) drop back in place automatically, leaving the rails continuous, as before.

DOG-HAULAGE.—At a small mine at Colchester, in McDonough county, Illinois, 31 dogs are employed in hauling mine cars in the mine and on the surface. It is, we believe, the only mine in the United States where this kind of motive power is in use.

MANGANESE IN CYANIDE SOLUTIONS.

By J. E. CLENNELL.

The following process is based on the method given by C. and J. Beringer[1] for the colorimetric estimation of manganese in ores and compounds free from chlorides.

Detection.—To 100 c.c. of the cyanide solution to be examined add 10 c.c. concentrated nitric acid. Heat to boiling, then add gradually ½ gm. of lead peroxide; continue boiling for a few minutes, allow to settle, and cool. The presence of manganese is shown by the pink color due to permanganic acid. The reaction is very delicate, quantities less than one part in a million of solution being easily recognized. The test is very simple and rapid. If lead peroxide is not at hand, it may easily be prepared by digesting red lead with nitric acid and filtering.

Estimation.—An approximate quantitative estimation may be made as follows: The contents of the flask containing the extract from 100 c.c., which will be somewhat concentrated by boiling, are again made up to 100 c.c., or to some other definite volume, with distilled water, recently boiled and cooled. Stir well, and filter through a small paper, rejecting the first portions of the filtrate, say 10 c.c. By means of a pipette, draw off an aliquot part of the filtrate, say 50 c.c.; compare the tint immediately with that of an equal volume of distilled water in a similar vessel, to which the standard permanganate is added drop by drop, with constant stirring, until the tints of the liquids appear identical. A one-foot test-tube of about 60 c.c. capacity may be conveniently used for holding the liquids; the color should be observed against a white background.

Standard permanganate.—This is made by dissolving 0.1435 gm. of potassium permanganate in 100 c.c. pure water, adding 10 c.c. pure concentrated nitric acid, and diluting to a litre. One c.c. of this solution will contain 0.00005 gm. of manganese. Hence, if 50 c.c. be taken for a test on an extract from 100 c.c. of the original cyanide solution, representing half the original quantity, every c.c. of the standard solution used will correspond to 0.0001 per cent, or one part manganese in one million.

Cautions.—If the test is merely to be made occasionally, it is advisable to prepare only a small quantity of this standard solution as required, as it soon loses its strength.

The success of the process depends entirely on the purity of the reagents used. The distilled water must be quite free from organic matter, iron salts or other reducing agents. In all cases a blank test should be made, using the same quantities of nitric acid, water, lead peroxide, etc., as in the actual assay. The filtrate from this should be colorless, but should give a tint, permanent for at least five minutes, on adding 1 c.c. of the standard permanganate. If this is not the case, a correction must be made for the reducing power of the reagents.

Ordinary filter papers have a slight action on the permanganate; but this does not materially affect the result if the test be carried out as described, rejecting the first part of the filtrate. Attempts to filter through glass wool were not successful, as some finely divided particles of lead peroxide invariably passed through and obscured the tint of the filtrate.

Influence of manganese in cyanide liquors.—The presence of manganese may, in some cases, exert an important influence on extraction and precipitation, although the addition of permanganate has been advocated as an aid to extraction. It appears to exist, at any rate, in the cyanide liquors obtained here, in a very unstable form. It is deposited as a brownish precipitate on boiling the solution, or even in some cases merely on standing. It is thrown down in a similar form in the zinc boxes at ordinary temperatures. When present in considerable quantity it also interferes with the filtration of the cyanide by silver nitrate, sometimes to such an extent as to render the estimation of cyanide impossible. The manganese always can be removed, however, by treatment of the solution with sodium sulphide, the excess of sulphide being afterwards removed by agitation with carbonate of lead in the ordinary way.

[1] 'Text Book of Assaying,' 9th edition, p. 306.

AN ITALIAN EXPOSITION.—An exposition at Milan, in 1906, is already planned to celebrate the opening of the Simplon tunnel. The exhibit will have an exclusively national character only in the department of fine art. Special attention will naturally be given also to the graphic and mechanical illustration of transportation by land and sea, including decorative arts in wood, metal, glass, etc.

MINERAL IMPORTS AND EXPORTS OF SPAIN.—Imports of fuel into Spain for the nine months ending September 30 included 1,599,610 tons of coal and 135,796 tons of coke. Exports of minerals for the nine months are reported by the *Revista Minera* as follows, in metric tons:

	1903.	1904.	Changes.
Iron ore	5,939,811	5,466,162	D. 473,649
Copper ore.	821,575	819,773	D. 1,802
Zinc ore	93.271	101,301	I. 8,030
Lead ore	2,009	3,836	I. 1,827
Pyrites.	432,731	397,051	D. 35,680
Salt	241,194	278,548	I. 37,354

Exports of metals were 32,130 tons of pig iron, against 37,490 tons last year; 23,155 tons copper, against 22,104 tons; 1,566 tons spelter, against 1,348 tons; 133,880 tons lead, against 122,235 tons last year.

FINE GOLD.—Three quite remarkable gold bars were received at the United States Mint at San Francisco recently from the new mining camp of Goldfields, Nev. The deposit comprising the three bars was valued at $45,100, which was the result of the reduction of 14.5 tons of ore taken out by leasers from one of the mines. This of itself is worthy of note, because of the richness of the ore. But two of these bars of crude gold assayed 987.5 fine and the other 981 fine. This is the finest crude gold which ever came to the San Francisco mint within the recollection of anybody now there—with the exception of certain gold of equal fineness from the Big Gun hydraulic mine from Michigan Bluff, Placer county, Cal., received some years ago. Gold of 987.5 fineness is worth $20.41 per ounce, and perfectly fine gold—1,000 fine—is worth $20.67 per ounce. Two of these bars only lacked 2.5 points of being considered fine gold, according to mint standards. If those points could have been added the leasers would have saved the refining charges on their 2,000 oz. In gold which is of a fineness of 990 or over, no account of the silver is taken in mint practice. In such cases it is not necessary to treat a bar further to use it for coining purposes, aside from the alloy. The gold, however, has to be 'tough' to be accepted as fine gold even when over 990 in fineness.

ROAD BUILDING IN THE FAR NORTH.*

By C. W. PURINGTON.

The subject of highway construction in Alaska is one of the highest importance to the development of that extensive territory. The deposits of gold-bearing gravel under exploitation are sufficiently valuable to support a considerable number of persons, and to maintain towns of important size, but the work which has been done in the interior has been conducted in spite of difficulties of transportation which would be hardly credible were they not substantiated by figures obtained from responsible men.

A serious detriment to the making of a road in Alaska is the thawing of the ground beneath the moss. Wherever the moss is penetrated, thawing immediately commences, and the trail, which for a time was passable, eventually becomes a filthy, slimy mass of mud, roots and broken stones, a difficult route for men on foot, a slow and tiresome road for loaded animals, and an impassable barrier for any sort of vehicle. In regions farther south, under temperate conditions, trails frequently are developed into fair wagon roads by much usage. Such a development can never take place in any part of the far North.

It is, of course, impossible that roads made in ground always subject to disturbance from alternate freezing and thawing should be as durable as those constructed under similar topographic conditions in most of the States. It will be seen, however, from the table of expenses given by the Canadian Government for this report, that the cost of maintenance does not exceed 15 per cent of the original mile-cost of the road. One feature cannot be too strongly impressed on those who are studying the Alaska conditions, and who have never seen the interior of that country. This is the extraordinary difference between the topography of the southeast coast, which is most often visited by tourists, and the portions of the country in which the rich placer deposits of the interior occur and have been developed. Take for example the placer areas lying between the Yukon and Tanana rivers, which are known under the names of the Birch Creek, Rampart and Fairbanks districts. Compare this topography with that of the country about Juneau, that of Admiralty and Baranoff islands, and of the Prince William Sound district. In the coast region the country is one of recent and sharp erosion, needle-like peaks, precipitous slopes, possessing cataracts in summer, avalanches in winter, and all the formidable conditions characterizing an Alpine district. Road building in such a region is necessarily expensive; rock cuts are necessary, expensive bridges and culverts must be put in, and trestling of cañons must be taken into account. Some idea of the expense attached to building roads in this portion of the territory is obtained from the wagon road that leads from Juneau into Silver Bow basin, and from the road which was built in 1898 from Skagway to the summit of the White Pass. In the one case the cost was $3,750 per mile, and in the other the cost was $6,000 per mile. Compare with this the Yukon-Tanana gold district. In the vicinity of Fairbanks 13 miles of passable wagon trail, over what is known as the Ridge trail going to the creeks, have been built at a cost of less than $100 per mile.[1] This road was made through a stretch of birch and aspen timber; the trees were cut out and many of the stumps removed; no ditch was made along the sides, and the road is barely wide enough for one wagon, but it is passable, and by virtue of its existence freight rates to Pedro and Cleary creeks, respectively, have already been reduced from 25 and 30c. per lb. to 10 and 15 cents.

It may be objected that transportation sufficient to meet the needs of the miner can

FIG. 1.—TYPE OF TOPOGRAPHY, SOUTH COAST PROVINCE.

be accomplished in winter, when the freight rates are much lower. This is far from being the case. The winter transportation itself would be greatly assisted by good roads, on which sleds of 4- and 5-ton capacity could travel. As to winter freighting, it may be stated that in the winter of 1903 a man contracted to transport a boiler weighing 5,600 lb. from the town of Fairbanks to Pedro Creek, a distance of 20 miles, for $2,000, and finished $300 in arrears.

In addition, it may be said that 75 per cent of the work of exploiting the gold-bearing gravel is done in the four months of the

FIG 2.—ROAD IN THE ATLIN DISTRICT.

open season, and it is then the miners are in need of the bulk of their supplies. The summer prices of commodities in the towns are frequently lower than the winter prices, the importation of supplies for the winter being confined to the month of August.

It must not be assumed that the ordinary miner of Alaska is of a provident disposition. Many men of great energy, and to whom the credit is due of having developed and opened large portions of this hostile country, are little disposed to take care for the future. Yet they possess pluck and determination which is deserving of the highest praise. Legislation by the Federal Government has hitherto done little to assist the Alaska miner. Outside of the matter of geologic and topographic exploration, and the making of excellent maps, the miner has been in no way assisted. A beginning was made in the case of the Valdes-Tanana-Crossing road, but, so far as can be learned, much money was expended and little accomplished. An act of Congress was passed April 27, 1904, authorizing the appointment of road overseers and the creation of road districts in the territory of Alaska. This act can be characterized only as an abortive attempt to improve the conditions existing, and was evidently formulated by some person utterly unacquainted with the conditions of the country.[2]

Province.	Locality.	Authority.	Construction cost per mile.	Annual maintenance, cost per mile.	Notes.
South Coast.	Juneau.	Private Constructors.	$3,750		Good road built under great topographic difficulties.
	Skagway-White Pass.	ditto.	$6,000		Road no longer used.
British Columbia.	Atlin.	B. C. Atlin, Gold Commissioner.	$300 to $1,000		Good roads easily built, very little corduroy
Yukon Territory.	Dawson and vicinity.	Canadian Dept. of Public Works of Yukon Territory.	$1,500 to $3,300	$350	Dawson standard highways constructed as described below.
ditto.	ditto.	ditto.	$250 to $350	$25	Sled or winter trails; rarely used in summer.
Central Yukon.	Tanana, Birch Creek, and Koyukuk districts.	Estimate based on work done by Canadian Government in Yukon Territory.	$1,200 to $3,000	$350	Dawson standard highways constructed as described below.
ditto.	ditto.	ditto.	$300	$25	Sled or winter trails.
Seward Peninsula.	Nome and vicinity.	Estimates based on cost of railways already constructed.	$3,000 to $4,000	$500	Dawson standard highways constructed as described below.
ditto.	ditto.	Private railway enterprises now in operation.	$6,000		Railway—3 ft. gauge, 20-lb. rail, 2600 ties to mile.

The appointment of a civil service officer who shall be general superintendent of road construction in Alaska would seem advisable. Under him should be appointed properly qualified road overseers in each district, all these men to have salaries commensurate with the cost of living in the Alaska communities. The recommendation of Mr. Brooks, of the Geological Survey, of an appropriation of $1,000,000, to be spent for wagon roads in Alaska,

* Published by permission of the Director of the United States Geological Survey.

[1] So low a cost would not have been possible had not teamsters hauled all necessary supplies gratis.

[2] Among the remarkable provisions of this law is one authorizing a salary of $4 a day to each overseer for a period not exceeding 10 days in one year.

is amply justified by the necessities of the case. It is probable that nine hundred miles of road (300 miles Dawson standard wagon and 600 miles sled) could, for the above sum, be built in those parts of the country which would be most assisted by their construction. Provision should, however, be made for their annual maintenance.

It is safe to say that the inhabitants would be as appreciative of such Federal aid as those of any portion of the American possessions. And furthermore, by such improvement in transportation facilities, the annual product in gold would be greatly increased.

FIG. 3.—WINTER TRANSPORT OF MACHINERY IN ALASKA.

Cost and Methods of Constructing Highways.—Considered from a highway standpoint, Alaska, owing to its varying topography and natural conditions, may be divided into three provinces, namely, the South Coast province, the Central Yukon province and the Seward Peninsula province. I was able also to inspect the excellent wagon roads which have been built in the northwest portion of Canada by the Canadian Government. The figures courteously given by the officers of the Canadian Department of Public Works relative to the cost of highway construction in the Yukon territory are considered applicable to the Central Yukon province of Alaska. This and similar information are included in the accompanying table, and some of the data are elaborated in the succeeding paragraphs. The object of the table is to embody in a form easy for comparison the costs of road building in the Northwest as exemplified by and estimated from previous experience.

The portions of Alaska represented by the Alaska Peninsula and neighboring islands, and the Copper River basin, north of Prince William sound, have not been especially considered, as there appears to be no present need of expensive routes of communication there. In general, it may be said, however, that the cost of construction in the Alaska peninsula is the same as in the Seward peninsula, and the cost in the Copper River basin the same as in the Central Yukon province.

South Coast Province.—Wagon roads, while extremely useful in this portion of Alaska, are so expensive of construction that it is not likely they will be built, except as heretofore, by private enterprise, to accommodate individual mining properties or groups of mines. The province is likely to prove in the future, as it has proved in the past, more important from the standpoint of quartz mining than alluvial mining. The construction of roads is none the less desirable on this account, and should any large area capable of producing mineral be found at a point remote from the coast, a highway to it over which freight could be handled all the year round would be highly desirable. Winter conditions are exceedingly severe in the higher mountains. In the construction of the White Pass & Yukon railway, 3 ft. gauge, 110.5 miles long, 1,500 men were employed for a period of two years and two months. Train service is maintained throughout the winter under considerable difficulty, both heavy winds and heavily drifted snow being frequently encountered. Rotary snow-plows have to be run daily, encountering drifts from 15 to 35 ft. deep. The average cost of handling snow for a season is $75,000. Characteristic South Coast province topography is illustrated by Fig. 1.

The Atlin District of British Columbia presents a much easier topography for road construction, and it will be noticed from the table that the cost is low. Fig. 2 shows a characteristic view of an Atlin road. Over seventy miles of such roads have been constructed in the district.

(To be continued.)

Fluorspar may be finely pulverized by the action of strong heat alone. At the same time it is decolorized and freed from the organic impurities to which the color is largely due. Other impurities, such as silica, gypsum, are mostly found in granules which are not reduced to powder by heat. These granules may be separated from the pure powder by screening. It is necessary that the heating be done quickly. It is probable that this method would be found valuable in a wide application to many other minerals. Indeed, the purification of heavy spar is quoted as being effected by heating and screening.

COAL IN HUNGARY.

From a monograph by Alexander von Kaliezinsky, abstracted in the London *Colliery Guardian*, we learn that true coal of Carboniferous age is in Hungary of but slight importance. Most of the coal-seams, and certainly the most important, are of Liassic age, notably at Fünfkirchen (or Pécs, as it is termed in Hungarian), in the Banat, and near Kronstadt. Eocene coals are mined between Komorn and Budapest at Gran, and more recent Tertiary coals are largely worked between the rivers Ipoly and Hernad; whilst lignites are widely distributed in Croatia and Slavonia. The Hungarian production in 1902 amounted to 6,202,153 tons, of which 5,103,236 tons consisted of brown coal and 1,098,926 tons of coal. The latter (Paleozoic and Mesozoic coal) was raised in 1899 in the following districts:

1. The coalfields near Fünfkirchen are worked by five companies, which produced 761,182 tons, and afforded employment to 5,218 workmen.

2. The South Hungarian coalfields, with 4,733 workmen, produced 470,018 tons.

3. The coalfield of Transylvania, where the one colliery, the Concordia mine at Vulkany, produced 7,648 tons.

The principal districts in which brown coal is produced are the following:

	Production. Tons.	Workmen.
Salgotarjan	1,387,364	4,939
Sajo Valley	945,500	3,441
Gran	343,060	1,893
Zsil Valley	714,377	3,558
Brennberg	76,793	816
Lajta-Ujfalu	105,143	370
Ajka	88,864	616
Mehadia	53,819	289
Vrdnik	72,373	419
Tata (Komorn)	301,860	1,829

Of the brown coal produced in 1899, 32.3 per cent was produced at Salgotarjan, 22 per cent at Gran, 16.6 per cent at the Zsil Valley, and 7.9 per cent at Sajo-Tal.

In the Fünfkirchen coalfield mining is being energetically carried on. The Liassic strata contain over 100 seams, some 30 of which are worked, their aggregate thickness being 50 meters. As a rule, seams of 18 in. in thickness are regarded as workable. There are now 12 shafts in operation, the coal raised being used for coke and briquette manufacture, and for heating purposes of all kinds. A typical analysis of Fünfkirchen coal shows 79.99 per cent of carbon, 4.10 per cent of hydrogen, 4.75 per cent of oxygen, 1.42 per cent of nitrogen, 1.33 per cent of moisture, 8.41 per cent of ash, and 1.21 per cent of sulphur.

In the South Hungarian coalfield at Eibental, the coal-seam (the so-called Danube seam) is 1.5 to 14 m. in thickness. A second seam (the Wenzel seam) is 24 m. thick.

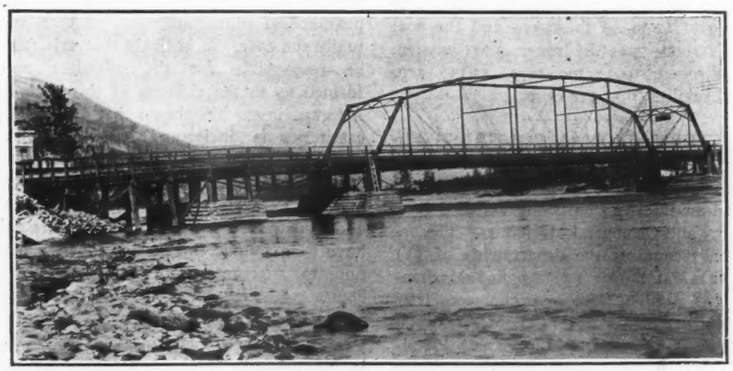


FIG. 4.—OGILVIE BRIDGE, OVER KLONDIKE RIVER.

The collieries at Anina, in Krasso-Szörény county, belong to the Austro-Hungarian State Railway. This Lias coalfield contains five workable seams, characterized by their great inclination and variable thickness. Firedamp is of frequent occurrence. The coal is suitable for coking, some 21,500 tons being made annually. The coal contains: Carbon, 71.52; hydrogen, 3.99; oxygen, 9.99; nitrogen, 0.85; moisture, 1.50; ash, 12.05, and sulphur, 0.28.

The Doman and Szekul collieries, in the mining district of Resicza, work four seams. The Doman coal is pure but friable. It is used partly for briquette manufacture, partly for heating, and partly, mixed with Szekul coal, for coke-making. The Doman coal contains 1.08 to 2 per cent of ash, and 0.35 to 0.55 per cent of sulphur. The Szekul coal contains 3 to 9.77 per cent of ash and 0.64 to 1.18 per cent of sulphur. The collieries at Doman-Resicza-Szekul belong to the Austro-Hungarian State Railway.

The chief center of brown coal mining is at Salgotarjan, in Nograd. At Salgotarjan itself there is only one workable seam 7 ft. in thickness. The coal is not suitable for coking, but is used for gas manufacture. In other parts of the district other seams are met with, the coal being in many cases converted into coke by basalt intrusions. A typical Salgotarjan coal contained carbon, 57.01; hydrogen, 3.99; oxygen, 13.38; nitrogen, 1.27; moisture, 9.42; ash, 14.93, and sulphur, 1.36.

In the Sajo valley, in Borsod, there is the Kaczola mine working two seams, 1.25 to 1.5 m. in thickness, respectively. The coal contains carbon, 41.30; hydrogen, 3.70; oxygen, 11.90; nitrogen, 1.61; moisture, 23.92; ash, 14.56, and sulphur, 3.01.

In the Zsil valley systematic mining began in 1868. The Oligocene brown coalfield is 25 miles long and 4 miles wide, the centers of activity being at Lupény and Petroszény. At the former locality there are nine seams, with a total thickness of 44 m., and at the latter 16 seams, most of which are of workable thickness. Coke from the Lupény coal yielded 0.55 per cent of moisture and 9.25 per cent of ash.

The Brennberg is the oldest colliery in Hungary, coal having been mined in 1753. The seam is 9 to 12 m. in thickness, and the coal contains carbon, 55.43; hydrogen, 3.73; oxygen, 16.68; nitrogen, 0.92; moisture, 15.13; ash, 8.11, and sulphur, 0.74 per cent.

AN INTERNATIONAL CONGRESS.—In anticipation of the Universal Exposition to be held at Liège, Belgium, in 1905, there has been organized an International Congress of Mines, Metallurgy and Geological Mechanics. The organization recognizes the departments of (1) Mines, (2) Metallurgy, (3) Applied Mechanics, and (4) Applied Geology. The secretaries of these departments are: (1) Mines, René Henry, rue Mandeville 206, Liège; (2) Metallurgy, Constant Renson, director of the Aciéries d'Angleur, at Renory-Angleur; (3) Applied Mechanics, Georges Duchesne, quai Marcellis 39, Liège; (4) Applied Geology, René d'Andrimont, rue Bonne-Fortune 15, Liège. The general secretary is Henri Dechamps, professor in the University at Liège, Belgium.

In estimating the water pressure to be delivered from a pipe supply, it is not sufficient to take into account merely the known head or fall of the water, as the loss due to friction in the pipes is considerable, being increased by bends or turns.

TIN IN THE UNITED STATES.

By F. Lynwood Garrison.

The recent discovery of notable deposits of tin in Alaska is likely to re-awaken interest in the possibilities of successful tin mining in the United States. Some observations of a general character upon the subject, therefore, will be of interest at this time.

Tin is the only one of the common commercial metals that is not regularly produced in the United States,[1] the entire consumption of this metal being supplied from abroad. Considering the diversified geological character of the country, this is a remarkable fact, since productive tin mines exist in Europe, Asia, South America and Australasia. From this circumstance, in connection with the relatively great value and price of tin, it may be easily understood why discoveries of this metal in the United States are certain to arouse exceptional interest.

Tin-bearing rocks and tin minerals have been found in a number of scattered localities from Maine to California, and from Alabama to Alaska, but in only two or three places have they been developed or exploited to any degree: At Harney Peak, in the Black Hills of South Dakota; at Temescal, ten miles south of Riverside in California; and to a small extent at the Cash mine, in Rockbridge county, Virginia. All these ventures were commercial failures, though in the Virginia case the causes which led to disaster possibly may be found to have been in the management and litigious disputes, as much as, if not more than, in unfavorable geological conditions. The history of the Dakota tin mines is interesting in several respects; it is, however, voluminous, and may be sketched here in only briefest manner.

About the year 1879 some cassiterite grains were found in the streams of the Black Hills, and in 1883 the ore was discovered in place near Harney Peak, which constitutes part of the granite core of a great uplift. The granite is coarsely crystalline, and is characterized by numerous crystals of tourmaline, columbite and tantalite, with particles of cassiterite (tin oxide) scattered here and there. The tantalum minerals, being black, closely resemble tin oxide, and gave the rock the appearance of containing more tin than was actually the case. It is likely that this fact may be responsible for the mistaken opinions formed as to the richness of this rock in tin, for experiment has shown that at the best the cassiterite is finely and irregularly disseminated in the granite. The tin appears to occur chiefly in the greisen[2] dikes, and possibly to some extent also in the metamorphic slates and schists. No true fissure veins are said to have been found; the tin ore shows a disposition to segregate with quartz in irregular bodies. Though much exploration and some actual mining was carried out in these South Dakota deposits, no improvement in the character or richness of the orebodies was experienced. Notwithstanding this fact, large sums of money were expended in machinery, development work and the purchase of adjoining claims that at the best were but questionable prospects, and the British company that was organized in 1887 with a large capital, to control and operate these deposits, was foredoomed to failure and bankruptcy.

A careful sampling of the Etta mine, the most important of the properties belonging to this company, is stated to have shown an average yield of under 40 lb. cassiterite (or 'black tin') to the ton of ore, that is, about 1.3 per cent of metal, which is a fair yield for any tin mine. The absolute failure of these deposits to develop into a commercial proposition throws some doubt on such statements, if intended to be taken as a general working average.

According to reliable information received from South Dakota, the 20-ton mill at Tinton, near the Wyoming line, has been recently in operation, and several carloads of tin concentrate shipped to Wales for treatment. It is at present not possible to determine whether this incident presages renewed attempts to develop the tin deposits of this region, or is simply an effort to realize on some ore already mined or blocked out. In either case it is interesting to know that the region is receiving some attention, though it may yet be many years before it obtains the thorough scientific and practical investigation it deserves.

It is said the Spaniards knew of the existence of tin in what is now San Bernardino county, California, but it was not until 1868 that any serious attempts were made to develop the deposits. In that year a company was formed in San Francisco for this purpose, and a considerable amount of money was spent, with disappointing results. After passing through a period of litigation the property was taken up in 1890 by a British company, known as the San Jacinto Estate, Ltd., the mines being situated a few miles south of Riverside, at Temescal, and they are commonly known by that name.

The geology of the district is supposed to be similar to Cornwall, in England. The rocks of the tin productive area are granite, porphyry, quartzite and slate. The ore is found in small veins or stringers composed of quartz, feldspar and tourmaline, similar to the 'tin capel,' or lode granite of Cornwall. Some of the orebodies are in the granite, others in the porphyry, and a few run into the slate. The deposits in the granite gave the best returns, but even this appears to have been unsatisfactory. The average yield has been variously given as 2 to 3.5 per cent of metal to the ton of ore as mined. If these returns are correct, which is doubtful, it is evident this mine cannot be considered poor for a tin deposit, since, as will be shown later on, such figures compare favorably with results obtained at successful tin mines in other parts of the world. There were probably several causes that contributed to the failure of this mining venture, such as high price of labor, extravagant management, etc., for it has not been conclusively demonstrated that the mine is exceptionally lean or that there is an insufficiency of ore reserves.

The high price of labor and fuel must have been a serious burden in the case of both the Dakota and California tin mining ventures, but, admitting this disadvantage, by no means has it been shown that these deposits could have been developed into successful operations had they been more favorably placed in regard to cheap labor and fuel.

These factors deserve special attention in connection with the proposed tin mining oper-

[1] An exception might be made to this in the case of platinum, which is produced in very small quantities.

[2] Greisen is described by Von Cotta as "a crystalline granular compound of quartz and mica." It is characterized as a granite without feldspar and its mica is chiefly of the lithia variety. It is usually associated with fluorides such as topaz, tourmaline and apatite. In Europe it is commonly associated with the tin deposits of Cornwall and Bohemia. It is also present in most, if not all, the American deposits, but some confusion seems to exist in distinguishing between it and pegmatite, which is essentially a granite composed of orthoclase, quartz, white mica and frequently tourmaline. The roughly determining element therefore between the two is the absence of feldspar in the greisen and its presence in pegmatite.

ations in the York regions of Alaska. Here such difficulties, together with an Arctic climate, are obviously serious, and, unless the deposits are exceptionally rich, or have other compensating advantages, which at present are not evident, failure is likely to result. It must also be remembered that the greatest tin-producing region in the world, the Malay Peninsula, is provided with an abundance of good and cheap labor, and an unexcelled position as regards transportation and fuel supply. Moreover, as will be seen later, these Malay deposits are not particularly rich, and if less advantageously situated, might not pay to work.

The presence of gold and silver in some of the Alaska tin deposits has been reported, and may prove a factor that will more than offset the disadvantages just indicated. According to the statements thus far received, the most promising tin deposits in the York region are the placers on Buck Creek, which are reported by Edgar Rickard[3] to yield 8 lb. of 60 per cent tin ore per cubic yard of gravel. Hess[4] reports returns as high as 27 lb. of 60 per cent tin ore to the cubic yard of gravel. Assuming a cubic yard of gravel to equal 1.5 tons of ore as mined in other places, we have a ratio of about 18 lb. of 60 per cent ore to the ton, equal to 10.8 lb. of metal, or 0.54 per cent to the short ton, a small yield as compared with some other localities.

The tin lode deposits of the Lost River district in the York region of Alaska are, according to Collier, apparently both extensive and promising of good results upon development.[5] Near Tin creek, a tributary of the Lost river, the main tin-bearing ledge outcrops as a white porphyritic dike cutting the Port Clarence limestone, and striking nearly east and west. It has been traced a distance of about one mile, and is supposed to have an average width of about 100 ft. This dike consists of greisen, having crystals of cassiterite disseminated through it. The limestone on its northern side is reported to contain many stringers of tin ore for several hundred feet.[6] Small quantities of gold and traces of silver have been found in the tin ore, which render the deposit unusual, if not unique, in respect to the precious metals.

The dike appears to carry cassiterite through its entire width. The content of tin is stated to run up to 17 per cent, and to average about 6 per cent of metal. Mr. Collier does not appear to vouch for this statement, which had better be accepted with caution. Considering the great size of the dike or deposit, it is highly improbable that the tin minerals will be found in a sufficiently concentrated condition to yield over an average of one per cent metal to the ton of ore as mined. Indeed, if the deposit is demonstrated as large as supposed, and the cassiterite is evenly distributed throughout the greisen, it must prove to be one of the greatest tin lodes in the world, and the presence of gold in the ore is likely, in some degree at least, to offset the climatic and other disadvantages of the locality, which would otherwise make profitable mining difficult.

In the eastern States tin has been found in a number of places, but only a few in the South have received any serious attention. At the headwaters of Irish creek, in Rockbridge county, Virginia, are situated a number of interesting tin deposits, among which is the once famous Cash mine. These deposits lie on the western slope of the Blue Ridge mountains, in the extreme northeastern corner of the county. The characteristic rock of the immediate vicinity is coarse granite, with outlying patches of slate. The granite is traversed by eruptive dikes, and they do not carry tin, which appears to be confined to quartz lenses and streaks in the granite, and is associated with arsenopyrite. It is stated that there has been metasomatic replacement of the granite by the tin oxide in the immediate vicinity of the ore-bearing quartz stringers or 'leaders'; this is characteristic of many tin deposits occurring in granite. An expensive mill was erected on this property about fourteen years ago by a Boston company, but it does not appear to have been operated except in an experimental manner. The results of these runs yielded from 3 to 3.5 per cent tin in the ore, which is probably a much greater return than can be expected when mine and mill are regularly operated.

The King's mountain deposit, in Cleveland county, North Carolina, is probably part of a belt of stanniferous rocks extending in a general northeast and southwest direction into South Carolina. None of the deposits in this zone have as yet been developed to any extent, though some little ore has been produced near King's mountain. The general reputation of the orebodies is favorable. The prevailing rock in which the tin ore is found is granite associated with metamorphic schist, slate and quartzite. The proximity of greisen is said to be characteristic here, as it is in many other tin deposits in different parts of the world.

The tin deposits near Gaffney, in Spartanburg county, South Carolina, are evidently in the same belt of tin-bearing rocks as those of King's mountain. During 1903 some development was carried on and several tons of ore shipped for testing. The results appear to have been satisfactory, as the work is being continued, 50 to 60 tons of concentrate having been shipped to New York this summer for treatment. From the best information available the Gaffney deposits have so far yielded encouraging results.

In conclusion, it is evident that tin cannot be considered a rare metal in the United States; it is certainly uncommon, and has yet to be produced on a commercial scale, but there is no reason to assume that this desirable end cannot be achieved, for there are evidently large areas of tin-bearing rocks in the country, especially in the South. In considering this whole question, it is of the greatest importance to have reliable data from other countries as to the yield, cost of production, etc., of mines that have been, and are now, producing tin in large quantities. The disasters that have overcome attempts to mine tin in the United States probably have been due more to ignorance of the tin mining business in general than to any other one cause.

In order to properly appraise the commercial value of the tin deposits already known, and any that may be discovered in the near future in the United States, it is essential to understand something of the results obtained elsewhere in this branch of mining. Frecheville[7] gives the average richness of a number of Cornish mines for the ten years from 1871 to 1881, in pounds of black tin per long ton, as follows: Dolcoath, 59 lb.; Cook's Kitchen, 43 lb.; Tincroft, 53 lb.; Carn Brea, 35 lb., which is approximately equivalent to 1.8 per cent, 1.3 per cent, 1.6 per cent and 1 per cent respectively in metallic tin. According to other authorities, the average yield in Cornish mines over a long period, was not over 45 lb. of black tin to the long ton, or 1.95 per cent, which is equal to about 1.5 per cent metallic tin. At Altenberg, in Saxony, the general average yield for a period of many years was from 0.3 to 0.5 per cent black tin (cassiterite), equal to about 0.2 to 0.4 per cent metal per ton. At Schlackenwald, in Bohemia, the yield is said to average from 0.4 to 0.5 per cent black tin, equal to about 0.25 to 0.4 per cent metallic tin to the ton. In the Zinnwald region, Bohemia, the average seems to have been about 0.5 per cent black tin, equal to about 0.4 per cent metal.

In Bolivia, South America, which appears to possess the richest tin deposits in the world, the average yield ranges from 3 to 5 per cent metallic tin to the ton of undressed ore. The yield of the Mount Bischoff mine in Tasmania is given at about 2.75 per cent black tin, equal to about 2.25 per cent of metal per ton of ore.[8] And at Durango, Mexico, according to Ingalls, the average tenor is something like 3.75 per cent black tin, or about 2.25 per cent of metal per ton of ore.[9]

In the Malay Peninsula nearly all the tin mined is obtained from gravel or placer diggings composed of the detritus from the granite and other crystalline rocks that constitute the backbone of the peninsula. The tin therein has been concentrated by nature in the gravel beds and bars. Including the neighboring islands of Banka and Billiton, where the deposits are of similar character, about two-thirds of the world's supply of tin is here obtained. Taking the region as a whole, the general average yield appears to be about 3.5 per cent black tin (oxide), equal to say 2.4 per cent of metal in the ton of gravel washed. Penrose[10] states that the average yield of the alluvium of the Malay Peninsula is 1 per cent black tin (cassiterite) per ton of gravel. Two per cent is considered exceptional, and 3 to 4 per cent remarkably rich.[11]

It is a curious and suggestive fact, which it is well to note, that none of the attempts to mine tin from rock in the Malay peninsula have so far been more than partially successful. Efforts in this direction have usually resulted in failure, as the ore is in too scattered condition to pay to work. Hence, though tin is frequently found in the rocks as well as in the alluvium, mining is mostly confined to the latter. According to Penrose, it seems probable that deposits may yet be found in the rock that can be profitably worked.[12]

According to Rolker, the tin yield at Siak, in Sumatra, is 2.7 lb. per ton, or 0.12 per cent of black tin, the average richness of the black tin being 70 to 72 per cent. Calculated on the total amount of ground excavated, including stripping, this would be 0.476 lb. of black or 0.348 lb. of metal ('white tin') per cubic meter excavated.[13] In Banka, according to Van

[3] THE ENGINEERING AND MINING JOURNAL, 1903, Vol. LXXV, p. 30.

[4] *Bulletin* 229, United States Geological Survey, 1904, p. 32.

[5] *Op. cit.*, pp. 19–21.

[6] THE ENGINEERING AND MINING JOURNAL, December 31, 1903, pp. 999–1000.

[7] 'Main Lode of Dolcoath,' *Transactions* Royal Geological Society, Cornwall, 1887, Vol. X, p. 154. Also *Bulletin* 229, United States Geological Survey, p. 52.

[8] Kayser, *Transactions* Federated Institute Mining Engineers, 1897, Vol. XIII, Pt. 3, p. 582.

[9] *Transactions* American Institute Mining Engineers, 1895, Vol. XXV, p. 160.

[10] R. A. F. Penrose, 'Tin Deposits of the Malay Peninsula,' *Journal of Geology*, Vol. XI, No. 3, p. 144.

[11] The average production of the Pahang Corporation is given at 2 to 2.75 per cent black tin, containing from 71 to 72 per cent metal, *i. e.*, about 1.5 per cent metal to the ton mined. THE ENGINEERING AND MINING JOURNAL, Vol. LXXVIII, p. 254.

[12] *Ibid.*, p. 145.

[13] *Transactions* American Institute Mining Engineers, 1891, Vol. XX, p. 64.

Diest, this same amount of excavation yields 2.2 to 3.3 kg. black, or 1.75 to 2.03 kg. (2.95 to 4.46 lb.) white tin or metal.[14] Rolker states that in Sumatra the panning tests in prospecting are higher, thus on panning 10,000 lb. of gravel from different creeks, 80 per cent gave an average result of 1.13 lb. metal to the long ton of stream gravel, or 1.75 lb. per cubic meter.[15]

It will be observed from the data above given that the yields reported for all the American deposits mentioned, compare favorably with those from the most productive tin districts in the world. It would perhaps be unfair to assume they are incorrectly given; the truth is that so far probably not enough ore has been produced regularly by any one American tin deposit or mine to render it possible to obtain a correct average. With a general upward tendency in the value of tin and the undoubted possibility of considerably decreased costs in operating with more improved methods and machinery, there is reason to hope and expect that renewed attempts to mine tin in the United States will be successful, especially in localities favored with cheap labor, fuel and a mild climate, such as is to be found in the southern States.

The mining community in this country is naturally rather ignorant of all that obtains to mining and smelting tin, and has been perhaps a bit gullible, but, as Emmons has pointed out, such ignorance is to be expected, especially on the part of prospectors. The close resemblance of cassiterite or 'tinstone' to the common magnetite would account for its escaping the notice of the average person.[16]

NITROGEN.—The three chief mineral foods required for plants are potassium, phosphorus and nitrogen. Nitrogen is obtained in the oxidized form of *caliche*, nitrate of soda, in Chile. This supplies the world, and the visible store will be exhausted before two score of years more. But the atmosphere contains nitrogen, and this will serve as an 'ore' of nitrogen. If the atmosphere could be solidified, the nitrogen would form a layer of about 20 ft. in thickness over the whole globe. This looks like an inexhaustible supply; but not all the nitrogen will be directly available, for whether it is obtained from the air as a nitrite or a nitrate, it requires much more than its own weight of oxygen, which must also come from the air. However, this should not cause any immediate worriment.

The various methods of extracting nitrogen from the air seem at present to be turning to the use of electrical energy in some form. The Bradley & Lovejoy system can make 1 ton of 70 per cent nitric acid per kilowatt-year. The Birkeland-Eyde process can effect the production of nearly a ton of pure nitric acid per kilowatt-year. The indications are that the present experimental phase is about to merge into an economic commercial stage.

A refractory fire-brick, suitable for certain purposes, is made by cementing quartz sand with milk of magnesia, drying and carefully burning. It is very infusible, and its co-efficiency of expansion on heating is not too high, which gives it additional value in construction.

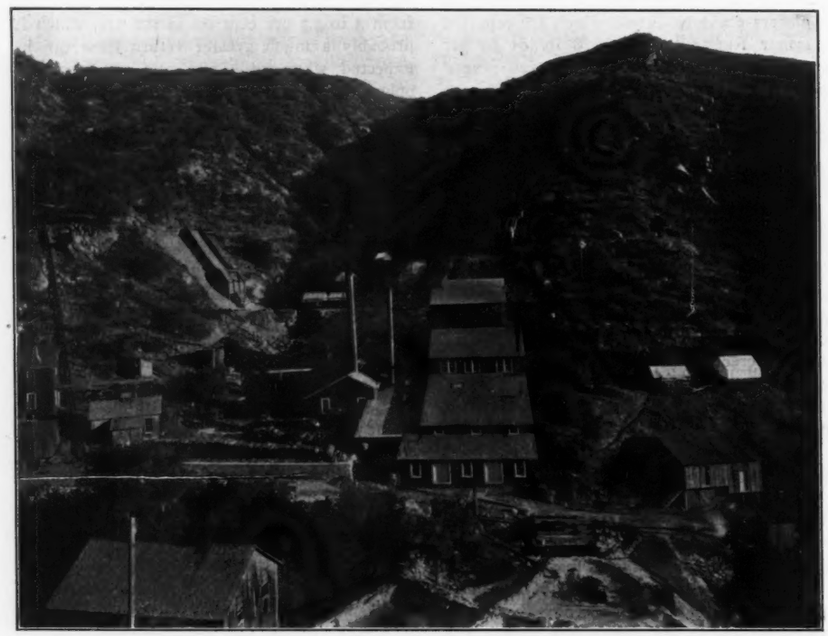
[14] *Ibid.* Quoted by Rolker, p. 64.
[15] *Ibid.*, p. 65.
[16] *Transactions* American Institute Mining Engineers, 1893, Vol. XXII, p. 72.

YAVAPAI COUNTY, ARIZONA.

BY OUR SPECIAL CORRESPONDENT.

Within the last six months the Santa Fé, Prescott & Phoenix Railroad Company has completed its branch line—60 miles long—from Prescott to Crown King, in the heart of the Bradshaw mountains. This branch takes in Val Verde, on the Agua Fria; Poland and Providence, on Big Bug creek; Mayer, Turkey creek and Middleton, and passes within a few miles of Chaparal, McCabe and Yeager cañon. All these are mining points which contribute to the mineral output of Yavapai county. The Crown King mine, which was operated from 1890 to 1901, paid dividends amounting to over $200,000; litigation between stockholders has kept the property closed down during the last three or four years, but a settlement is shortly expected. In the meantime the Crown King Mines Company has been organized by J. L. McLean, of Boston; John R. Graham, of Bangor, Me., and Geo. P. Shurtleff, of Prescott, the last named being manager. This company has acquired large holdings contiguous to those of the original Crown King company, and now has close arrangements with the latter, the presumption being that the new company, which has a lease on the old mill and the 50,000 tons of tailing, containing zinc and iron, accompanied by gold and silver, will eventually operate the holdings of both, comprising 76 claims. The mill is to be started to work these tailings; it is equipped with Dimmick sizers, tables and vanners. A centrifugal pump and belt-conveyor are also to be installed. The tailing dump resulted from the earlier operations, which included crushing, amalgamation and concentration, about half the saving being on the plates. Within the mill are drier, roaster and Campbell magnetic separators, which were in use last year in making a separation of the iron from the zinc. Two fairly clean products were obtained, and it is asserted that this work is to be supplanted by straight concentration, since the Val Verde smelter decided to take the product and charge no penalty on the zinc. The Crown King Mines Company has started a cross-cut through the entire series of veins, cutting 1,900 ft. below the highest point, and 500 ft. below the 500-ft. level of the Crown King workings. In general, the ore consists of quartz containing the sulphides of iron, lead, copper and zinc, accompanied by gold and silver, much of which is in free state. The projected cross-cut starts near the railroad track, where a compressor plant will be installed. The belt of mineralized country referred to is traceable for a long distance, other mines in contiguous districts showing an alignment.

The group of the Tiger Gold Company, four miles south of Crown King, is locally known as the Oro Belle. The holdings comprise seven claims, having three parallel veins striking northeast-southwest through a diorite country. The property is developed by a system of adits, the lowest one, from which most of the ore is taken, being 825 ft. long. Cross-cuts have been driven from the main adit to the other veins. All the workings are above the mill level, excepting a winze which extends 300 ft. below the main adit. The principal vein dips at 26° and is 5 to 30 ft. wide between walls. The ore consists of a gold and silver-bearing pyrite, in a quartz and clay gangue. In the 20-stamp mill about half the values are recovered on the plates, the balance in the concentrate, concentration being in the proportion of 8 to 1. Coal is used as fuel for steam power at present, but arrangements are being made to use fuel oil, which will cost $2.25 to $2.40 per barrel delivered at the mine. Geo. P. Harrington is manager, with A. G. Scherer as assistant. The mill handles 50 tons of ore per day. Work in the mine is done with air-drills, a Sullivan compressor furnishing the power. The underground work aggregates 8,400 ft. The mine post office is called Harrington.



TIGER MINE AND MILL, HARRINGTON, ARIZONA.

The property of the Oro Mining Company is eight miles southwest of Crown King. This was opened and partially equipped a number of years ago, being originally known as the Bowes mine. It is now in control of B. Heller and associates, of Chicago, with Oswald Stein as superintendent. There are 22 claims in

the group, 16 of which are patented. The principal vein, whose strike is northeast-southwest through a granite country, is covered by 10 claims in series. This vein has a regular dip to the north, and ranges 4 to 10 ft. wide. The ore comprises a lead and iron sulphide in a white quartz, containing gold. A shaft has been sunk 540 ft. on the vein. The first level is 160 ft. below the collar, and is 1,700 ft. long. The second level is 200 ft. below No. 1, and is 180 ft. long. The work shows a well-defined vein, uniformly mineralized. The mill is equipped with 20 stamps, crusher and two sets of rolls, with leaching vats for cyanide treatment, but it is now proposed to put in amalgamating plates and concentrating tables.

The Mohawk Mining Company has a property six miles west of Crown King, covering a gold-bearing vein in granite. This is developed by a 300-ft. shaft, which will be sunk to 700 ft. There is 600 ft. of drifting at the 100-ft. level; 300 ft. at the 200-ft., and 350 ft. at the 300-ft. level. The ore is a free-gold quartz. A five-stamp mill has been used for testing the ore. Jas. S. Skoeff is superintendent, with H. P. Bardshar as foreman. Air-drills are in use, the compressor being driven by a gasoline engine. The property is near Hooper post office.

The property of the Bradshaw Mountain Copper Mining & Smelting Company covers 6½ miles of the copper zone, striking northeast-southwest, about half way between Crown King and Mayer. It extends northeasterly from the old Peck mine, a prominent producer in early days. Three veins have been developed by the company; on one of these work is extensive. The country is schist, with a porphyry dike on one side and a quartzite dike on the other, the entire belt being bounded on both sides by granite. The vein material is a schist, carrying a variety of copper ores, including malachite, azurite, black oxides, cuprite, bornite and chalcopyrite, with some chalcocite. The upper adit, 250 ft. long, discloses an ore-body 8 to 30 ft. wide. A stoped-out chamber, timbered with square sets, is 30 ft. wide and 80 ft. high. A 400-ft. winze connects this level to a level below, following the vein. The same vein is opened by a 1,188-ft. cross-cut, 400 ft. below the upper adit. The ore on this level also is of good width, and comprises bornite and chalcopyrite. Shipments now run about three cars per day, 92 cars having been sent out during September. This ore ran from 8 to 10 per cent copper, with $3 to $5 per ton in gold and silver. It is stated the general average of the mine is 5 per cent copper. Sullivan air-drills are in use, the air compressor of that make being at the railroad station at Middleton, one mile from the mine. Ore-bins at Middleton have 2,000 tons capacity, and are connected with the mine by a Bleichert aerial tramway 4,000 ft. long. The fuel used at the steam plant is oil. Water for all purposes is conveyed to the camp from various springs through seven miles of pipe-line. This company owns the Val Verde smelter, recently destroyed by fire, the rebuilding of which is now in progress. The new furnace, blowers and power plant to be installed will be put within a steel structure. G. W. Middelton is general manager of the company, with offices at Prescott. R. L. Clarke, assistant manager, is in charge of the mine; S. E. Bretherton is superintendent of the smelter at Val Verde.

The Geo. A. Treadwell Mining Company, managed by E. D. Treadwell, at Mayer, is erecting a smelting plant at the latter place. It will contain a matting furnace 42 by 120 in. at tuyeres, with other necessary equipment, and is intended to smelt the copper ores of this company, which owns the Hackberry, Iron Queen and Boggs mines. The plant erected some time ago at Mayer by the Treadwell company, which provides for the use of oil as a fuel for smelting, was operated a short time last year, and Mr. Treadwell says it will be employed in the future in smelting the flue-dust and fine material in connection with the other plant.

The Rigby Reduction Company, using the Pohle-Croasdale volatization process, has erected extensive buildings for a plant at Mayer, and some of the equipment is on the ground, but no part of it has been put in position.

The Gladstone mine, at McCabe, is being worked under lease to C. G. Fennell, who likewise operates the concentrator at Val Verde. The Gladstone has a 790-ft. shaft on the vein, with levels from each 100-ft. station. The vein strikes northeast-southwest, between syenite and schist. The ore carries gold, silver and lead. The production amounts to 1,000 tons per month. The low-grade material is milled at Val Verde, the high-grade is shipped to the smelter. Mr. Fennell leases the mine from the Ideal Mining Company, and he leases the mill from Douglas, Lacy & Company.

The mine and mill of the Model Mining Company, at McCabe, are under the management of Chas. T. Joslin, with A. C. Massey as superintendent. This group has several veins, which converge at the southwest end. An incline shaft sinks 700 ft. on the principal vein, showing an 8 to 10 in. streak of high-grade ore, and a streak of mill-ore from one foot to two feet wide. This is known as a narrow, high-grade vein. Most of the drifting is northeast from the shaft, the longest drift being from the 300-ft. station, a distance of 960 ft. Below the line of oxidation—at 40 ft.—is an iron sulphide, with a small amount of copper, lead and zinc, all carrying gold and silver. Of the 2,000 tons hoisted per month, about 12 per cent is first grade, that goes direct to the smelter, the remainder being milled on the ground, and giving 240 tons of concentrate. The mill has 10 stamps, an Elspass mill, three Standard tables and one Wilfley. Steam power is used at mill and hoist, oil being used as fuel.

The Dividend group, at Chaparal, consisting of 11 claims, has been developing and producing for several years. It is managed by F. E. Biles, who has sunk four shafts, the total workings aggregating over 7,000 ft. Several veins are opened, which appear to converge. The veins are on contacts of granite and porphyry. The gangue is mostly a quartz, the ore consisting of an iron-lead sulphide, the values being gold, silver and lead. Of the production, 15 per cent is sent to the smelter direct, the rest is milled. The mill ore runs $20 to $25 per ton, the saving being made on plates and tables. A force of 20 men is employed.

The Jessie mine, at Chaparal, is in a fair way to resume work after some time of idleness. It is controlled by John S. and Jesse T. Jones and their eastern associates. A new shaft-house has been erected and a duplex air compressor installed, with new boilers. The old mill is being newly equipped. It is also announced that a larger, modern mill will be erected next season. There are 14 claims in the Jessie group; on these there is 2,500 ft. of development. The main shaft is 657 ft. deep, and is being enlarged to two compartments. A second shaft is 300 ft. deep. The ore is an iron sulphide, carrying gold. The lode is claimed in places to be 100 to 150 ft. between walls, the ore occurring in lenses.

The Iron King mine belongs to the American Copper Company, of which Ben Blanchard is general manager, with J. J. Murray as superintendent. The location, near the railroad at Blanchard station, is ideal. The mineralized ledge is in slate and schist. From the surface to the 200-ft. level the ore is oxidized, and has been extracted by amalgamation and cyanide treatment; but below this level it becomes baser, with much copper in the southwest end of the group. The deepest shaft has reached 430 ft., and there are other shafts, each over 200 ft. deep. The mill is operating on the oxidized ore, and in the meantime development in the mine is going on extensively. For the sulphide ore a smelter is anticipated. The mill is provided with six Hendy and six Nissen stamps, which crush about 70 tons per 24 hours. The pulp passes from batteries through 20-mesh screens to amalgamating plates, then to a sump, to be pumped to a distributing tank above the leaching vats. By leaching ten days, an extraction of 75 per cent is made, 0.75 lb. cyanide per ton being used. The mill is driven by a 100-h.p. gasoline engine, made by Fairbanks, Morse & Company, the fuel being crude Coalinga oil. Water for mill-work and other purposes is pumped from the Agua Fria river, 1½ miles distant, with a lift of 450 feet.

The Cyprus mine, near Big Bug, has a 300-ft. shaft, with some drifting on a vein of copper ore. The vein is in syenite, sixteen cars of ore shipped containing 18 per cent copper, with some gold. An air compressor is to be installed. J. M. McDonald and W. H. McKay are directing affairs.

The Mount Union Mining Company is developing a property 14 miles south of Prescott. Two shafts, 200 and 460 ft. deep, respectively, have been sunk on different veins. The ores are sulphides of iron, lead and copper, carrying gold and silver. A mill is being erected, the equipment being crusher, two Huntington mills and four concentrating tables. E. Greenwood, of Prescott, is manager.

The Cash mine, 14 miles south of Prescott, has been producing several years, under the management of H. Blauvelt. It has two working shafts and a 10-stamp mill. The ore comprises sulphides of iron, lead, copper and zinc, carrying gold and silver. The mill has plates and tables, about half the gold being recovered by amalgamation. The concentrate shipments amount to 100 tons per month. A force of 40 men is employed. Mr. Blauvelt is also operating the Monte Cristo mine and five-stamp mill in Groom creek district. This ore yields gold and silver in iron sulphides, the mill-work being strictly concentrating. Shipments of concentrate amount to 30 tons per month, and 15 men are employed.

Fluorite usually flies to pieces violently when heated before the blowpipe, but when pulverized it can be fused, giving forth the yellowish-red flame characteristic of lime. When broken into fragments and heated moderately in a closed tube, it phosphoresces, emitting, in some varieties, a yellow light, in others a beautiful green glow. A hammer blow is sufficient to cause a mass of fluorite to exhibit phosphorescence for hours.

The electric process, for making special grades of steel, can compete with the costly crucible process.

THE FIRE-CLAYS OF MISSOURI.*

BY H. A. WHEELER.

The Missouri fire-clays are divided into two classes, or (1) flint fire-clays and (2) plastic fire-clays, that have very different properties and a marked difference in their geological occurrence. Both are used by the fire-brick manufacturers, and each class has its merits for its proper uses. The Missouri flint fire-clays are exceptionally pure, are devoid of plasticity, and if their excessive fire-shrinkage is removed by a preliminary burning, they make the most refractory or infusible fire-brick that it is possible to make out of clay, or a brick that can not be fused or injured by the highest heat attainable in a coal or coke fired furnace. But while they are ideal for withstanding heat from their infusibility, they are unsatisfactory in shaft furnaces or similar conditions where there is abrasive action. For their tensile strength or cohesion is so slight that fire-brick made exclusively of flint clay rapidly wear out from the abrasive action of the descending charge. But in the arch of an open-hearth furnace or in the checker-work of a regenerator, where only a severe gaseous heat has to be withstood, they are very durable and satisfactory.

The plastic fire-clays of Missouri are tough, plastic clays that are only fairly fire-resistant, as they are rather impure, but they make a strong, durable brick that admirably withstands mechanical wear or abrasion. They are excellent for gas and zinc retorts, shaft furnaces, lime-kilns, etc., but can not stand extremely high heats without 'letting down,' or softening or fusing.

By skillfully combining the flint and plastic fire-clays in proper proportions, the experienced fire-brick maker can produce a brick that possesses ample refractoriness combined with a maximum strength or toughness if the customer will clearly define the conditions under which the brick is to be used. For most purposes, the best fire-brick is composed of more or less pre-burned flint-clay as 'grog,' with the body or bond composed of plastic clay. Too frequently the metallurgist only considers the refractoriness or the purity as shown by a chemical analysis of a fire-brick, and overlooks the mechanical weakness caused by use of an excessive quantity of the non-plastic flint-clay, and the fire-brick are consequently short-lived from being rapidly cut out by abrasion. While by no means all of the fire-brick makers have modernized and adopted testing laboratories equipped with Seger cones and Le Chatelier pyrometers, in most cases the fire-brick maker is better qualified to design a fire-brick to meet given conditions than the metallurgist, and longer campaigns and fewer re-linings of furnaces would result if this responsibility was transferred to an intelligent, up-to-date maker. Not all of the Missouri fire-brick makers belong to the latter class, for some of them still claim, as did their revered grandfathers, a heat resistance of 4,000° to 5,000° F. for their fire-brick, although a Le Chatelier pyrometer shows that it is unsafe at 2,600° F. or over.

The St. Louis market furnishes some 10 well-defined grades of fire-brick that range in heat resisting limitations from 2,300° to 3,000° F., and from $14 to $35 per 1,000 f. o. b. cars at factory. They are manufactured by both the old-time hand-press or slop process and by brick machines of both the auger and semi-dry types. As regards the respective merits of the hand vs. the machine-made brick, there is no question that the old hand-press makes a more refractory, superior brick, but the machine-made brick are more uniform and are now made with such care as to be quite satisfactory and more economical. The machine-made brick is also becoming of much greater importance in these days of labor troubles in greatly reducing the amount and skill of labor required for a large output.

The preceding marked range in refractoriness and price of fire-brick gives no clue whatever as to its value to the metallurgist, as the cheapest brick, which is entirely made of plastic clay, would prove far more durable (in the hearths of roasting furnaces, linings for water-jacket furnaces, and the linings of lime-kilns, where abrasive action is severe, but the heat ranges from 1,600° to 2,200°) than the highest priced brick, which is capable of withstanding 3,000° F., being made entirely of flint fire-clay.

The flint fire-clays of Missouri occur in the eastern-central portion of the State, at a distance of 40 to 140 miles west of St. Louis, and along the Wabash, Colorado or Rock Island, Missouri-Pacific and Frisco railroads. They are found in local pockets, of very variable size, that are possibly of Cretaceous age in limestones of sub-Carboniferous and Lower Silurian age. The pockets are evidently old sink-holes in the limestone that have subsequently become filled with clay, and probably at such an extremely slow rate as to permit of the almost completed removal of the impurities by chemical solution, including some of the silica of the kaolinite base. The pockets are fringed with a sandy transition bed that terminates in a sandstone which always lines the flanks of the sink-hole. This sandstone represents the silt or coarse matter that was promptly deposited, as a delta, by the inflowing streamlets that brought the detritus from the adjacent weathering limestone in rainy weather, while the finer, clayey matter was deposited in the central portion of the sink-hole. The sandstone always dips on all sides towards the center of the pocket, and at angles of 15° to 35°. The laminations of the clay deposit have since been destroyed by the chemical action of the water that filled the basin, so that the flint clay has a very characteristic hard, massive, jointed structure, and it breaks with a sharp, conchoidal or flint-like fracture that gives the clay its name.

Most of the pockets are filled with a light-gray colored flint clay that usually contains only 1 to 2.5 per cent of impurities, and is exceptionally pure; occasionally it is more or less heavily contaminated with red oxide of iron, which, of course, ruins it for refractory purposes.

The flint clay has a hardness of 3 to 3.5 per cent, and is devoid of plasticity, unless very finely ground, and then it is plastic to only a slight extent. Even the weathered outcrop of the flint clays is usually devoid of plasticity, and consists of small, sharp, angular fragments.

The pockets are like most sink-holes in being usually circular in shape, and of very variable size, producing from 5 to 500 carloads before exhaustion. They range from 25 to 300 ft. in diameter and from 10 to 40 ft. in depth. The flint clay is usually worked on leases by local shippers, who pay the farm-owners about 5c. a ton royalty. The pockets are worked as open pits, and with a haul of one-half to three miles over poor roads, the flint clay usually sells for $1 per ton, f. o. b. cars at local points, which brings the price delivered at St. Louis to between $1.50 and $2 per ton.

Chemical analysis shows that the Missouri flint-clays are very low in impurities, and have from 0.5 to 3.5 per cent alumina in excess of the amount contained in pure kaolinite. The flint clays vary from 40.8 to 48 per cent silica, 37 to 43.2 per cent alumina and 13.3 to 15 per cent combined water. The water is apt to be very much higher than in pure kaolinite. Fluxing impurities are also very low, the analysis of nine average samples from different banks showing 0.40 per cent oxide of iron, 0.70 lime, 0.20 magnesia and 0.50 alkalies. This purity, combined with coarse grain and high density, make these flint clays most refractory of all known clays, and able to withstand a temperature of 3,000° F. safely.

As the flint clays are not plastic, it is necessary to mix them with a plastic or bond clay, in order to mold them into bricks, and this is done with the local St. Louis fire-clay, either raw or after washing. Efforts have been made to bond the bricks with very finely ground flint clay, and these have been successful enough to produce a brick, but it is tender, and will not withstand abrasion or careless handling in transit.

On account of the large amount of water contained in the flint clays, which is expelled at a red heat, there is an excessive shrinkage in burning, so that it is necessary to calcine the clay before use, in order to prevent this shrinkage, which is as high as 10 to 14 per cent.

The plastic fire-clays of Missouri occur at the base of the coal measures in the eastern portion of Missouri in two different basins, known respectively as the St. Louis and Mexico areas. The St. Louis basin is the extreme western fringe of the Illinois coal basin, which overlaps into St. Louis and St. Charles counties in Missouri. The Mexico basin is the eastern fringe of the coal measures that cover central western Missouri, and which are quite distinct from the Illinois coal measures.

The St. Louis basin is much smaller in size, but is much more important than the Mexico basin. It covers the western portion of the city of St. Louis, considerable of St. Louis county, and a small part of St. Charles county. The entire area, including some small detached outlying basins, aggregates about 170 square miles, in the form of an irregular polygon. While there are several sheets of clays and shales in the lower coal measures in this basin, only one, which is known as the St. Louis fire-clay seam, is refractory, or capable of withstanding a heat of 2,500° F., and this rests on the ferruginous sandstone, or the basal member of the coal measures. This seam is a sheet of typical coal-measure clay that varies from 4 to 40 ft. in thickness, though it usually averages from 6 to 8 ft., lies about horizontal, has a roof of 1 to 22 in. of bituminous coal, and rests on a transition bed of sandy, green clay that merges into the ferruginous sandstone. The fire-clay outcrops at the base of the valleys, where it is entered by adits, and is worked by shafts 25 to 125 ft. deep on the higher ground.

The St. Louis fire-clay has a light- to dark-gray color and is a hard, rock-like clay, when freshly mined, that rapidly disintegrates into soft, tough plastic paste on exposure to the weather or when ground with water.

It is worked on the room and single-entry system, and mined by hand-picking a side cut

*Abstract of a paper read before the American Institute of Mining Engineers, St. Louis, September, 1904.

along the pillar, and then blasting to this cut with black powder. Formerly this was done by contract at 35 to 50c. per cubic yard (2 tons), but it is now paid by day work, the miners receiving $2 per day. While most of the fire-brick plants own their own clay mines, there are quite a number of independent leasers operating on a royalty basis of 3 to 5 per cent a ton, who sell their output to St. Louis and distant consumers. The principal mines are in the western part of St. Louis, in what is known as the Cheltenham district, and the St. Louis fire-clay sells for 60c. to $1 a ton, f. o. b. cars for mine-run, and from $1.50 to $2 for selected clay, or for about half the prices of New Jersey fire-clays.

There is a specially selected grade known as 'pot-clay,' that is used for glass pots, which is obtained from a purer, more uniform seam that occasionally occurs from 1 to 4 ft. thick in the middle or upper part of the bed. The pot-clay sells for $10 to $14 a ton, f. o. b. cars, St. Louis.

The St. Louis fire-clay bed varies considerably in character and value, as well as in thickness. While the general character of the clay is coarse-grained and moderately silicious, the silica ranging from 58 to 63 per cent, it occasionally becomes very coarse and sandy, and the silica increases to 70 per cent; more frequently, it becomes finer-grained, and the silica decreases to 50 per cent. The clay always contains more or less iron pyrites ('shiners' or 'sulphur' or mundic), and while this is usually disseminated through the clay as fine crystals to the extent of 1 to 3 per cent, it sometimes segregates into coarse granules and nodules. The latter form is exceptional, and while very easy to remove by washing, it causes local fusion, as a black slag, if allowed to get into the fire-brick. The redeeming feature of the excessively high iron in the St. Louis fire-clay lies in the fact that it is nearly always finely and uniformly disseminated through the clay—in fact, the pyrite crystals are usually so very small as to not be removed by washing. It is the iron that gives the fire-brick made from St. Louis clay their brown color when hard burned, while the fine pyrite crystals cause the small black specks. The fire-brick are white to light in color if underburned.

When the fire-clay occurs abnormally thick, as in the northern part of St. Louis county, lower portions of the bed are more or less seriously contaminated by calcareous concretions that resemble boulders of limestone, and which ruin the clay for refractory purposes, unless it is either very carefully sorted or washed.

The St. Louis fire-clay, after weathering or grinding, is plastic to very plastic. As measured by the tensile strength test, it ranges from 80 to 150 lb. per square inch in air-dried briquettes, and the prolonged weathering of several years develops as high as 250 lb., or it is unusually tough for a fire-clay. Clays of average plasticity usually show a tensile strength of 100 lb. When made up into a stiff mud, with 14 to 20 per cent of water, it shrinks from 6 to 9 per cent in air-drying, and the air-dried clay shrinks 4 to 8.5 per cent when burned to vitrification (the limiting point of shrinkage), or the total shrinkage varies from 11 to 16 per cent. The clay can be rapidly dried without cracking and heated without checking, even when treating is quite rapid.

Incipient vitrification begins at 2,100° to 2,250° F.; complete vitrification, or the safety limit, occurs at 2,300° to 2,450° F., and viscosity, or initial fusion, takes place at 2,500° to 2,700° F., when the clay is only moderately refractory. The hard-burned ware forms a close body that has great strength, which largely contributes to its exceptionally high value for zinc retorts and glass pots.

The St. Louis fire-clay is coarse-grained and has a high specific gravity, which later ranges from 2.40 to 2.47 in the mine-run, and from 1.92 to 2.13 in the washed clay. It is largely this coarse grain and high density that renders the St. Louis fire-clay as refractory as it is, with its unusually high percentage of fluxing impurities, for a fire-clay. In fact, extensive work on the Missouri clays, using Le Chatelier pyrometer for the heat measurements, clearly brought out the fact that it is impossible even approximately to determine the refractoriness of a clay from a mere chemical analysis, as density and size of grain have such an important influence.

The St. Louis fire-clay is most interesting in its chemical composition, as its high fluxing impurities, combined with high silica, would cause its unqualified condemnation by the analytical chemist as a refractory clay. As a matter of fact, it is unequaled in this country for glass pots, zinc-retorts and gas-retorts, while it makes an unusually durable fire-brick where the heat is not excessive. These statements allude to ware made exclusively of St. Louis fire-clay, without the addition of Missouri flint clay to improve its refractoriness.

The fluxing impurities, or iron, lime, magnesia and alkali, will usually range from 5 to 6 per cent, seldom going as low as 4.5 and occasionally as high as 7.3 per cent. As good fire-clays are usually claimed to range from 2 to 4 per cent impurities, and as 1 per cent increase frequently lowers the fusibility at least 100° F., a chemist would be disposed to condemn all the St. Louis fire-clays for even moderate refractory requirements. High silica, which is always due to more or less free silica, when it exceeds 46 per cent, also adds to the fusibility of a clay to a small, though still undetermined extent. Formerly, it was supposed to be a harmless diluent, like titanic acid, but the researches of Seger seem to leave no doubt as to the detrimental action of free silica, though he probably exaggerated its extent. The average composition of St. Louis fire-clay, based upon average samples obtained from seven different mines and four washeries, is as follows: Combined silica, 32; free silica, 25; alumina, 24; combined water, 10; titanic acid, 1.1; iron sesqui-oxide, 1.85; iron protoxide, 1; lime, 0.7; magnesia, 0.2; potash, 0.55; soda, 0.1; sulphur, 0.18; sulphuric acid, 0.4 per cent. The average specific gravity was 2.

There are seven plants engaged in the manufacture of fire-brick in the city of St. Louis, and one in St. Louis county. They also make the usual tiles and special shapes called for by the refractory trade, while three make gas-retorts that are shipped throughout the country. The St. Louis county plant is only five years old, but the other seven are from 20 to 50 years old. The amount of capital employed is about $2,500,000, and the annual value of the output in 1903 approximated $1,400,000, which is exclusive of a large sewer-pipe output produced by two of the larger plants. These figures, while considerably larger than those given in clay statistics published annually by the United States Geological Survey, are regarded as more reliable. In addition to the above, from $125,000 to $150,000 of fire-clay is produced annually by independent leasers, most of which is shipped, as about all the zinc smelters in the United States depend on the St. Louis fire-clay for their retorts.

The extent of the Mexico fire-clay basin has not been defined, and the workable fire-clay has only been found along the fringe, at or near the outcrop of the basal coal measures. It contains only one bed of refractory clay, which has been worked at Fulton, Mexico and Vandalia, or over a distance of 50 miles, while outliers are known to occur beyond their limits. It may be said to be an irregular parallelogram at least 75 miles long by 5 to 15 miles in width. The fire-clay rests on the ferruginous sandstone, with an intermediate transition bed of sandy clay that is more or less green (iron) stained. The seam is usually thick, varying from 6 to 40 ft., but only the lower 6 to 12 ft. is sufficiently pure for refractory purposes. It is mined through shafts that range from 40 to 150 ft. deep. It is a light- to dark-gray colored, hard, rock-like clay that is blasted from the solid by the room-and-entry system, but it requires considerable timbering.

The clay, after weathering or grinding, makes a fairly plastic paste that has a tensile strength of 40 to 80 lb. per square inch when dried. When moulded with 14 to 16 per cent of water, it has a shrinkage of 4 to 5 per cent, and an additional shrinkage when burnt to vitrification of 6 to 7 per cent, giving a total shrinkage of 10 to 12 per cent. Incipient vitrification begins at 2,200° to 2,309° F.; complete vitrification, or the danger line, occurs at 2,200° to 2,500°, while viscosity, or initial fusion, takes place at 2,600° to 2,700° F.

The fire-clay of the Mexico basin is decidedly purer than the St. Louis seam, the iron especially being much lower, while the total fluxers range between the usual amounts found in most refractory clays.

The average composition of samples from the four principal mines of this district is: Silica, 52; alumina, 33; combined water, 12; iron sesqui-oxide, 1.5; lime, 0.5; magnesia, 0.7; alkalies, 0.7 per cent. The average specific gravity is 2.44.

There is a moderate-sized plant operating at Vandalia and another at Fulton that have been running about 20 years, while a third was in existence at Mexico until 1895. A small plant was built at Truesdale in 1896, amid the flint clays, but it had a short life. These plants labor under the disadvantages of not having freight competition; their coal costs considerably more than at St. Louis, and they have no home market for even boiler-grade goods. It is hardly surprising that this district has shown no growth in recent years in competition with the more favored St. Louis district. The capital invested aggregates about $150,000, and the value of the output is about $100,000 yearly.

Heat, according to the dynamical theory, is motion among the particles of the substance heated, which motion, when once produced, may be changed in its direction and nature, and thus be converted into mechanical effect, expressible in foot-pounds or horse-power. By intensifying this motion among the particles, it is made evident to our visual organs by the emanation of light, which is vibratory motion imparted by the ignited substance to the separating medium. From this point of view, heat, light, electricity and chemical action are only different manifestations of the energy of matter, mutually convertible, but as indestructible as matter itself.

BOOKS REVIEWED.

University of Illinois Bulletin. Volume II. No. 1. Tests of Reinforced Concrete Beams. By Arthur N. Talbot, Urbana, Ill.; published by the University. Pages, 64.

This bulletin is the first of a series which will be published giving the results obtained at the Engineering Experiment station of the University of Illinois. This station was established in December of last year, for the purpose of carrying on investigations along various lines of engineering, and of studying problems of importance to engineers and to manufacturing, railroad and constructional interests. This establishment involves the equipment of the laboratories of the College of Engineering with additional apparatus and facilities for research work. There is no doubt that very interesting results can be secured in this way. The present volume is an example of this, and includes the results of a large number of tests of reinforced concrete beams, a type of construction which is beginning to come into extensive use, and on which comparatively few tests are yet available. In addition to the experiments on reinforced concrete, tests were also made on concrete beams, on bond of steel and concrete, and on the elasticity and strength of concrete in tension and compression. It is not claimed that the experiments are complete as yet, but that a beginning has been made on an elementary line. Upon this a further series of tests will be made, extending the scope of the work and increasing its value accordingly. The results here will undoubtedly be studied with interest by engineers generally, and especially by those interested in concrete construction.

A Treatise on Metamorphism. Monograph XLVII. By Charles Richard Van Hise. Washington, D. C.; The United States Geological Survey. Pages 1286; illustrated with 13 plates. Price, $1.50.

This treatise is an attempt to reduce the phenomena of metamorphism to order under the principles of physics and chemistry, or, more simply, under the laws of energy. Metamorphism is broadly defined to include all alterations of all rocks by all processes. The metamorphism of the sedimentary rocks was the first subject studied by the author, and metamorphism has been a chief line of investigation with him for more than twenty years. Finding that the alteration of rocks was nowhere systematically treated, he took up the task of preparing such a work. It was supposed that this work would occupy two or three years, but, as a matter of fact, it required seven years, and an eighth year has been needed to put the volume through the press.

The book consists of twelve chapters. Chapter I discusses the geological principles upon which a classification of metamorphism may be based. From this discussion it is concluded that the only practicable classification of metamorphism is geological. It is found that the alterations of the outer zone of the earth are radically different from those of the deep-seated zone. Moreover, it is shown that the alterations in the upper zone result in the production of simpler compounds from more complex ones, whilst those in the deep-seated zone result in the production of complex compounds from more simple ones. The upper zone is called that of katamorphism, and the lower zone that of anamorphism.

Chapter II, upon the forces of metamorphism, discusses chemical energy, gravity, heat and light. The manner in which each of the classes of energy produces various mechanical and chemical effects upon rocks is set forth.

Chapter III treats of the agents of metamorphism. The agents of metamorphism are gaseous solutions, aqueous solutions and organisms. Under aqueous solutions, the chemical and physical principles controlling the action of ground-water and the circulation of ground-water are fully discussed. This involves a full résumé of the science of physical chemistry so far as applicable to the alterations of rocks. This résumé is not simply a summary from text-books of physical chemistry, but discusses the applications of the principles to the phenomena of metamorphism.

Chapter IV, upon the zones and belts of metamorphism, discusses these zones and belts from the physical-chemical point of view. It is shown that the alterations of the zone of katamorphism occur with liberation of heat and expansion of volume, the chief reactions being oxidation, carbonation and hydration. The alterations of the zone of anamorphism occur with absorption of heat and diminution of volume, the chief reactions being deoxidation, silicification with decarbonation, and dehydration. Thus the alterations in the two oppose each other. The zone of katamorphism is divided into two belts, that above the level of ground-water, the belt of weathering, and that below the level of ground-water, called the belt of cementation. While the physical-chemical principles of alteration are the same in each of these belts, the geological processes are very different. The belt of weathering is characterized by solution, decrease of volume and softening, resulting in physical degeneration. The belt of cementation is characterized by deposition, increase of volume and induration, resulting in physical coherence.

Chapter V treats of minerals. Each of the rock-making minerals is discussed with reference to its occurrence and alterations. The alterations are considered from the physical-chemical point of view. An attempt is made to write chemical equations which represent the transformations, and to calculate the volume relations resulting. It is found that a great number of rock-making minerals undergo two classes of changes, one of which is characteristic of the zone of katamorphism, and the other of which is characteristic of the zone of anamorphism. Perhaps the most important generalization of this chapter refers to the reversibility of reactions in the two opposing zones. This generalization is as follows: The equations which represent the reactions in the zone of katamorphism are reversible in the zone of anamorphism; and so far as there is expansion of volume and liberation of heat in the upper zone, just so far is there condensation of volume and absorption of heat in the lower zone.

Chapter VI considers the belt of weathering. The belt of weathering being the one which is most readily observed, has been treated by many authors. The chapter in this volume on weathering differs from previous discussions in that the phenomena are not considered mainly from the descriptive point of view, the emphasis being given to the classification of the phenomena and their explanation under physical and chemical principles. Another important feature of this chapter is the consideration of the phenomena of the belt of weathering in relation to the alterations of the other belts of metamorphism.

Chapter VII treats of the belt of cementation. This belt is defined as extending from the belt of weathering to the bottom of the zone of fracture. The geological results are found to contrast very markedly from those of the belt of weathering. In the latter belt solution is the rule; openings are enlarged; the rocks degenerate. In the belt of cementation, upon the other hand, the processes of metamorphism continuously deposit material, the openings are closed, and thus the rocks are consolidated. Each of the cementing substances is considered, and an explanation is offered as to why cementation rather than solution is a general process in this belt.

Chapter VIII treats of the zone of anamorphism. This is the zone in which rock-flow occurs. Full explanations of the meaning of rock-flow and of the development of such secondary structures as slatiness, schistosity and gneissosity are offered. Perhaps the most important generalization is that "rock-flow is mainly accomplished through continuous solution and deposition—that is, by re-crystallization of the rocks through the agency of the contained water. But rock-flow is partly accomplished by direct mechanical strains. At the beginning of the process, during the process, and at the end of the process, the rocks, with the exception of an inappreciable amount, are crystallized solids."

Chapter IX treats of rocks. A classification of the sedimentary rocks is given, their genesis is discussed, and the series of transformations through which each of the rocks passes is traced out, the resultant rocks being indicated. It was not found possible to give a similar treatment for the igneous rocks.

With the ninth chapter the subject of metamorphism proper closes, but the results contained in these nine chapters have an important bearing upon other parts of physical geology. The remaining chapters consider these relations.

Chapter X discusses the relations of metamorphism to stratigraphy. It is shown that in consequence of metamorphism great difficulties are introduced in stratigraphical work. The nature of the difficulties and the manner in which they may be overcome are fully considered.

Chapter XI treats of the relations of metamorphism to the distribution of the chemical elements. This is perhaps the most daring of the various attempts at generalizing in the treatise. It is shown that, as a result of the forces and agents of metamorphism, the elements of the original igneous rocks are redistributed, a given element being less abundant in the larger number of sedimentary rocks than in the original rocks, and, corresponding with this depletion, each of the elements is segregated in one or more formations. An attempt is made to treat the problem of the redistribution of the elements quantitatively. Assumptions are made as to the total mass of the sediments and of the relative proportions of the more important classes of sediments. Combining these assumptions with the results of chemical analyses, the losses and gains of various formations for each of the important elements of the earth are considered. Many surprising results are reached. For instance, we find the conclusion that to oxidize the ferrous iron of the original rocks to the ferric condition in which most of it occurs in the sedimentary rocks, 35 per cent of the amount of

oxygen in the atmosphere has been required. But still more startling is the conclusion that to oxidize the sulphur and iron of iron sulphides in order to produce the sulphates of the ocean and gypsum deposits, and to transform the iron to the ferric form, required one and one-half times the amount now in the atmosphere.

The final chapter of the book, XII, is upon the relations of metamorphism to ore deposits. It is probable that this chapter will receive more general attention than any other. The material of the other chapters is of a kind which is likely to be of interest to the geologist only, whereas this chapter is of interest to all men concerned in the great mining industry. The chapter upon ore deposits occupies 240 pages and, indeed, might have been named, 'The principles of ore deposition.' From the author's point of view, the majority of ore deposits are produced by metamorphic processes. Having worked out the general principles of metamorphism with reference to rocks, the author found that the application of these principles to ore deposition explained the majority of ore deposits. From his point of view the proper theory of ore deposition consists mainly in bringing the particular phenomena exhibited by ore deposits under the general principles of metamorphism. The chapter contains a new classification of ore deposits, the fundamental divisions of which are the same as those of rocks. Thus ore deposits are divided into three classes; those of sedimentary origin, those of igneous origin, and those of metamorphic origin. Strictly the treatise on metamorphism should, perhaps, have considered only the third class. However, the first and second classes are sufficiently discussed, so that the relations of these ores to those produced by metamorphic processes may be appreciated. The discussion upon ore deposits is too elaborate to be summarized in this general statement. But it may be remarked that for the metamorphic ores an attempt is made to trace out the solution, transportation and precipitation of each of the chief economic metals. Also the alterations and further segregation of metals are fully considered. The conclusion is reached that in many cases an ore deposit does not represent a single segregation, but is the result of repeated segregations by the same general processes which result in the depletion of certain elements in the various rock formations and their segregation elsewhere. In other words, the principles of the development of ore deposits are the principles of the segregation of those elements which are of importance to man, but which, for the most part, are so rare that they are not included in the discussion in the chapter upon the re-distribution of chemical elements.

It is not possible in a summary to give any adequate idea of the scope of this treatise on metamorphism. A very broad range of facts, extending far beyond what might at first be regarded as a part of a treatise on metamorphism, is considered from the energy point of view. It is believed that the volume marks a great stride in the reduction of the entire subject of physical geology to order under the principles of physics and chemistry.

By infiltration of silica in solution a quartzite may be changed to solid quartz, which is hardly distinguishable from vein quartz. Examination under the microscope, however, usually shows the outlines of the original sand grains marked by a rim of secondary quartz.

BOOKS RECEIVED.

In sending books for notices, will publishers, for their own sakes and that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

United States Geological Survey. Production of Mineral Waters in 1903. Washington; Government Printing Office. Pages, 30.

Annual Report of the Smithsonian Institution, 1903. S. P. Langley, Secretary. Washington; Government Printing Office. Pages, 940; illustrated.

Geological Survey of Georgia.. Preliminary Report on the Bauxite Deposits of Georgia. By Thomas L. Watson. Atlanta, Ga.; State Printer. Pages, 172; illustrated.

Western Australia Statistical Register. Part V. Compiled in the Office of the Government Statistician. Perth, W. A.; Government Printing Office. Pages, 80.

Poor's Manual of the Railroads of the United States. Thirty-seventh Annual Number, 1904. New York; Poor's Railroad Manual Company. Pages, 1490; with maps. Price, $10.

Notes on Assaying and Metallurgical Laboratory Experiments. . By Richard W. Lodge. New York; John Wiley & Sons. London; Chapman & Hall, Ltd. Pages, 296; illustrated. Price, $3.

The Anthracitation of Coal. By David Burns. Newcastle-upon-Tyne, England; Reprinted from the *Transactions* of the North of England Institute of Mining and Mechanical Engineers. Pamphlet, 16 pages.

Underground Temperatures, Especially in Coal Mines. By Hans Hoefer. Newcastle-upon-Tyne, England; Reprinted from *Transactions* of the North of England Institute of Mining Engineers. Pages, 24.

Proceedings of the American Association for the Advancement of Science. Fifty-third Meeting. 1904. L. O. Howard, Permanent Secretary. Washington; published by the Association. Pages, 636.

Annual Statistical Report of the American Iron & Steel Association. Prepared by James M. Swank, General Manager. Philadelphia; the American Iron & Steel Association. Pages, 94. Price, $3.

The Action, Influence and Control of the Roof in Longwall Workings. By H. W. G. Halbaum. Newcastle-upon-Tyne, England; Reprinted from *Transactions* of the North of England Institute of Mining Engineers. Pages, 24; illustrated.

Geological Survey of Alabama. Bulletin No. 8. *The Materials and Manufacture of Portland Cement.* By Edwin C. Eckel. *The Cement Resources of Alabama.* By Eugene A. Smith. Montgomery, Ala.; State Printers. Pages, 96; illustrated.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

The Colorado Labor Troubles.

Sir—I have followed, though with some weariness, the recent discussion in your columns of the Colorado labor troubles. It is understood, of course, that many journals, being dominated by monied influences, dare not open their columns to a fair discussion of any labor difficulty—dare not present the labor side of any controversy. Have you not yourself proved that the editor of the leading mining journal of the continent may not say a word—not for justice, but merely for common sanity—in considering labor troubles, without incurring the displeasure of his wealthy patrons?

These things being obvious enough to any intelligent person, why not be non-committal? Is it necessary to give space to a performance so discreditable as the recent "discussion"? One would think that a journal of high standing in the engineering profession would avoid such subjects like the very plague, rather than impeach its integrity and cloud the fair name it has earned in other departments, by lending its columns to apostles of anarchy because they wear an air of respectability and array themselves on the side of capital. Mining journals, as a rule, cut a sorry figure in their labor discussions.

So does the mining engineer, who so commonly suffers himself to become a bigoted and intolerant partisan of capital. If he possessed a fraction of that mental and moral superiority which he assumes for himself, he must ask: "To what end do I devote my trained intelligence, the result of years of preparation and experience?" And the answer must always be: "Why, chiefly to heap up more riches for those whose excessive wealth is already a curse to themselves and every one else." He must observe how the sinister influence of an unjust distribution of wealth permeates society, corrupting its every phase and deforming human nature in every walk of life, and welcome all reforms which tend to make life normal and rational. Welcome? Nay more; he must find his ordinary service intolerable without doing an educated man's part toward freeing himself and his fellow workers from these odious conditions.

And so he does, if he is neither an automaton nor a flunky. If he has taken his degree in manhood, as well as his degree in mathematics, I am convinced he does desire and seek a better end for his labors, a better aim in life than making dollars for Rockefeller. Unfortunately, however, it is the bigoted or subservient that discusses labor difficulties in a mining journal. So I say, "Cut it out."

As communications from the socialist's point of view do not appear in your columns, I will not comment on the Colorado outrages further than to remark that, if the workers are not permitted to secure justice by constitutional means; if a group of monied anarchists, with their hireling thugs and ex-convicts, can override the popular will as expressed at the ballot-box, then we are near to another civil war, another French Revolution, perhaps, unless Americans have become a degenerate race, and that I am unable to believe.

In conclusion, I repeat that I believe THE ENGINEERING AND MINING JOURNAL, and mining journals in general, would command a wider respect if they eliminated the subject of labor troubles from their columns, or limited all notice thereof to a bold statement of undisputed facts. Your discussion of professional subjects is admirable, but when you tackle labor difficulties, it is another matter altogether. PETE SWANSON.

Kasaan, Alaska, Nov. 1, 1904.

There were 7,222 manufacturers and 627,047 domestic consumers supplied with natural gas for light, heat and power in 1903.

ABSTRACTS OF OFFICIAL REPORTS.

Federal Mining & Smelting Company.

The first official statement, covering the year ending August 31, 1904, shows that the ore shipped was valued at $4,908,926, and yielded a gross profit of $1,690,524. Deducting from this sum $219,625 for general and administrative expenses, and adding $18,374 interest, and $2,810 from rents and dividends, makes the net income $1,492,083. This amount has been still further reduced by the allotment of $67,709 to the reserve for legal contingencies, and $38,649 for incorporation costs, explorations, examinations, etc., which left $1,385,725. From this there has been paid in dividends $629,309, leaving a surplus for the year before charging depreciation of $756,416.

Mine labor cost $1,056,207; mine supplies, $379,379; mill labor, $103,399; mill supplies, $76,201; in all, $1,615,186, which is equivalent to nearly one-third of the value of the ore shipped during the year. The freight and treatment charges absorbed $1,615,573, singularly almost the same amount as was expended for labor and supplies, as noted above.

The mining property, real estate, water rights, plant, buildings and equipment are valued at $14,970,794; stocks and bonds held in other companies, $96,835; ore on hand, $9,358; supplies on hand, $3,000; bills receivable, $105,000; accounts receivable, $90,564; unexpired insurance, $5,933; cash, $961,162; total assets, $16,242,646. The liabilities are: Capital stock, preferred, authorized, $20,000,000; issued, $10,000,000; common, authorized, $10,000,000; issued, $5,000,000; accounts payable, $185,793; outstanding dividends, $635; Empire State-Idaho Company's reserve, $232,093; legal contingencies, reserve, $67,709; surplus for year before charging depreciation, but after payment of dividends, $756,416; total, $16,242,646.

The business actually transacted by the company is that of mining and concentrating silver-lead ores, and selling the same to smelters. Operations were begun September 1, 1903. Of the authorized capital stock, the company controls and is about to retire $500,000 par value preferred stock, and $250,000 par value common stock, thus leaving the outstanding capital stock $10,000,000 preferred and $5,000,000 common. There were issued $10,500,000 preferred, and $5,250,000 of common stock upon the acquirement of all the mining property formerly owned by the Empire State-Idaho Mining and Development Company, the Standard Mining Company, and the Mammoth mines in the Coeur d'Alene district, Idaho, also the Everett smelter in Washington. The smelting property has since been sold without loss to the company. There are three principal groups of mines: Wardner (formerly belonging to the Empire State-Idaho Company), the Mace (formerly owned in part by the Standard Company and in part constituting the Mammoth group), and the Burke (formerly the Tiger-Poorman group). The Wardner mines are situated near Wardner and on the main line of the Oregon Railroad & Navigation Company. The Burke mines are at Burke, and the Mace at Mace. Both groups are reached by the Northern Pacific and the Oregon Railroad & Navigation railroads. The Wardner group includes upwards of 40 patented and numerous unpatented claims and several hundred acres of patented agricultural lands. The mineral claims cover more than 7,000 ft. in length of the outcrop of the Wardner lode. About half of this length has been prospected; the remainder is subject to future development. The Burke group includes 10 patented mineral claims, covering one mile in length of the outcrop of the Tiger-Poorman vein. The present workings cover about half the length of the vein; the remainder is still unprospected. The company also owns interests in two other concerns, controlling an additional mile of the length of this vein to the west of the Burke mines. The Mace mines include 14 patented mineral claims, one mill-site and two unpatented mineral claims. It covers 4,600 ft. of the length of the vein. At these mines the company owns large and modern concentrating, pumping, hoisting, compressor and electric plants, in value as follows: At the Wardner mines, about $170,000; at Burke, about $195,000; at Mace, about $338,000. The company is advised that the Wardner mines have in sight 200,000 tons of ore, and in reserve, more than 700,000 tons. Burke mines, in sight, 180,000 tons, and in reserve, 3,000,000 tons. Mace mines, in sight, 1,200,000 tons, and in reserve, 2,000,000 tons. In this estimate, ore is considered 'in sight' only when it has been definitely developed and is above present working levels. Ore is considered 'in reserve' when, although beyond or under the present working levels, the existence of the vein has been ascertained from explorations, and its size and quality have been proved.

The company has entered into a contract with the American Smelting & Refining Company, by which the latter agrees for a period of six years from September 1, 1903, to purchase the entire output of the Federal Company.

QUESTIONS AND ANSWERS.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Rutile.—Can you tell me anything about rutile; its uses, value, occurrence and other facts? —J. T. M.

Answer.—The uses of rutile have heretofore been limited. Small quantities have been used in the manufacture of artificial teeth, and also of porcelain ware. In these cases it is used as a pigment. Lately, experiments have been made in the use of this mineral for making ferro-titanium and titanium steel. This may result in a larger demand; but in any event, the quantity required is not likely to be large, as only a small percentage is used in the steel alloy.

Concerning the nature and occurrence of rutile, George P. Merrill—'Non-metallic Minerals,' pages 109 and 110—says: "Rutile is a titanium oxide, having the formula TiO_2—oxygen 42 and titanium 58 per cent. The hardness is 6 to 6.5; sp. gr., 4.18 to 4.25; luster, metallic adamantine, opaque as a rule, rarely transparent; color, reddish brown to red, rarely yellowish, blue, or black; streak, pale brown. The mineral crystallizes in the tetragonal system, and is commonly found in prismatic forms longitudinally striated, and often in geniculate or knee-shaped twins. Not infrequently it occurs in the form of fine thread-like or acicular crystals penetrating quartz. It is insoluble in acids and infusible.

"Rutile occurs mainly in the older crystalline granitic rocks, schists and gneisses, but is also found in metamorphic limestones and dolomites, sometimes in the mass of the rock itself, or in the quartz of veins. Being so nearly indestructible under natural conditions, it gradually accumulates in the débris resulting from rock decomposition, and is hence not an uncommon constituent of auriferous sand.

"Some of the better known localities are, according to authorities, the apatite deposits of Kragerö, in Norway; Yrieux, near Limoges, in France; the Ural mountains, and the Appalachian regions of the United States. Graves Mountain, Ga., Randolph county, Ala., and the Magnet Cove region of Arkansas are celebrated localities.

"Near Roseland, Nelson county, Va., rutile is found disseminated in a coarsely crystalline quartz feldspathic rock of evidently igneous origin. The mineral occurs mainly in the form of small granules of all sizes up to 2 or 3 mm. in diameter, which are sometimes disseminated with remarkable uniformity throughout the feldspathic groundmass or again segregated in the quartz; rarely pieces of several pounds' weight have been found loose in the soil. The rock is remarkably free from other minerals than those mentioned, and there is a complete absence of titaniferous iron or heavy constituents such as would render difficult a separation of the rutile by the ordinary gravity methods. The ore is mined from opencuts, stamped and concentrated on the premises, the yield varying from 5 to 25 per cent of rutile concentrate in the form of a beautiful resinous red-brown sand."

At present the supply for the United States comes entirely from these Virginia mines; and they can furnish a much larger quantity than is now used, should it be needed. The European supply is from Norway.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

SPECIALLY REPORTED.

FAILURE TO PAY RENTAL DOES NOT TERMINATE LEASE.—Where a contract between a land owner and a corporation gave the latter the exclusive right of putting down a gas well on certain property, and provided that until this was done the latter should pay $20 per year for the exclusive privilege, and that such contract should be deemed terminated whenever it should fail to pay such rental price within sixty days after it became due, failure to pay did not terminate the contract, but merely gave the land owner the right to do so.—Hancock vs. Diamond Plate Glass Company (70 *Northeastern Reporter,* 149); Supreme Court of Indiana.

OFFER TO PAY RENTAL INSUFFICIENT WHEN DEVELOPMENT IS DELAYED.—Where an oil lease stipulates that it is to be void if a test well is not completed in three years, unless the lessee pays rentals during the time drilling is deferred, the rights of the lessee, after failure to sink the well as required, will not be extended by a mere offer to pay the rentals, if the lessor elects to treat the lease as terminated. But a suit to cancel the lease, begun several months before the expiration of three years, is premature, without a statement that the well cannot be completed within the time.—Armitage vs. Mt. Sterling Oil & Gas Company (80 *Southwestern Reporter,* 177); Supreme Court of Kentucky.

PERFORMANCE OF COVENANTS IN OIL LEASE CREATES A VESTED INTEREST.—Where one entered on land and produced gas under an instrument by which another conveyed all the oil and gas on the premises, together with the exclusive right to enter on same and drill and operate for oil and gas, maintain and remove buildings, pipes, machinery, etc., in consideration of certain payments to be made, he acquired a vested interest in such land for the purposes specified, and a breach of his agreement to develop the land for oil in accordance with the contract did not give the other the right to declare a forfeiture or procure a cancellation of the instrument.—Carr vs. Huntington (70 *Northeastern Reporter*, 552); Appellate Court of Indiana.

WAVE-MOTORS.—The utilization of the energy of waves and tides has long evaded realization. A recent suggestion by Mr. Pablo Garcia promises an advance over every other proposal for harnessing these tantalizing water horses. The invention uses compressed air for receiving and storing the force wasted in the intermittent action of waves and tides. It is possible that the development of this idea may prove the solution of the problem. Our real prime movers are but few; therefore a successful solution would mean much to civilization.

PATENTS RELATING TO MINING AND METALLURGY.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending November 15, 1904.

774,732. VALVE FOR HIGH-PRESSURE PUMPS.—William J. Baines, McKeesport, Pa., assignor of two-thirds to William Wood, McKeesport, Pa., and A. N. McCaslin, Pittsburg, Pa. A casing having an inlet-passage and an outlet-passage, a removable cap having a depending portion projecting in close proximity to a valve to limit the movement of the latter, and a flanged bushing arranged in the inlet-passage and forming a valve-seat, combined with a valve having a projecting portion to work in the bushing, and having an annular flange overlying the flange of the bushing, said annular flange of the valve having an annular groove in its underneath face, and a packing-ring fitted in the groove, and being of an exterior diameter equal to the flange of the valve and of an interior diameter equal to the flange of the bushing.

774,736. APPARATUS FOR TREATING FINELY DIVIDED MATERIAL FOR THE RECOVERY OF METALS.—Daniel C. Boley, Deadwood, S. D. In an apparatus for treating material by an upward flow of fluids, the combination of a tank having a bottom perforated for the upward passage therethrough of the fluid, of a lining of textile fabric secured to the bottom of the tank by means of folds of the fabric itself, whereby overlying battens above the fabric are dispensed with and perforation of the fabric obviated.

774,748. MINER'S PICK.—William H. Foley, Mapleton, Ill. A handle-socket for tools comprising a member having a seat and a terminally disposed deflected tongue carried by the member

774,767. SAFETY ATTACHMENT FOR HOISTING-ENGINES.—Fred W. Lyons, Grand Junction, Colo. The combination with a hoisting mechanism, including an operating device, of a screw-shaft revoluble with the hoisting mechanism, a nut disposed on the shaft and movable longitudinally thereof, means for holding the nut from revoluble movement, a pair of rods serving partly as guides for the nut, tappet-blocks disposed in the path of movement of the nut, and a means connected to the tappet-blocks for cutting off the actuating medium of the operating device.

774,778. COMPRESSED-AIR LOCOMOTIVE.—Wilson R. Pratt, Topeka, Kan. The combination with a locomotive-engine and tank, of a compressed-air tank on the tender, air-engines and compressors driven thereby also on the tender, a second tank on the locomotive-engine taking the exhaust from the air-engines, a heater also on the locomotive-engine receiving air from the compressor and from the second tank and delivery-pipe from the heater to the driving-cylinder of the locomotive-engi.

774,786. GOLD-SAVING APPARATUS.—Louis Sachse, Oroville, Cal. In a gold-saving apparatus, the combination, with a tank having upper and lower compartments arranged one above the other and having a floor between them, said compartments intercommunicating through an opening in said floor, means restricting the outflow from the upper compartment; means vertically over the opening adapted and arranged to intercept the precipitates from such liquid through the opening ino the lower compartment, and means for supplying a current of water in opposition to the downward current of water above said opening in said floor

774,788. CHARGING APPARATUS FOR BLAST-FURNACES.—Karl Schneider, Koblenz, Germany. The combination with adjacent blast-furnaces, of apparatus adapted to supply both of said furnaces from a single hoist, said apparatus consisting of a combined charging-receptacle and conveyer receiving the charge of material from the hoist and normally occupying a position above the top of one of the furnaces, and a runway for said receptacle-conveyer leading to a corresponding position above the top of the other furnace

774,795. ROLLING-MILL.—Ralph C. Stiefel, Ellwood City, Pa., assignor, by mesne assignments, to National Tube Company. In a rolling-mill, the combination with the rolls, of turning devices having roughened surfaces for engaging and positively rotating the billet about its longitudinal axis, and means for positively reciprocating said turning devices transversely to the direction of movement of the billet independently of the rolls.

774,796. ROLLING-MILL.—Ralph C. Stiefel, Ellwood City, Pa., assignor, by mesne assignments, to National Tube Company. In a continuous tube-rolling mill, the combination of a plurality of pairs of rolls, a removable mandrel-bar between each pair separate from the mandrel-bar between any other pair, and removable supports for the rear ends of the mandrel-bars, means for supporting the mandrel-bars in position relatively to the rolls, and means for operating the said parts to pass the tubular billet successively through all the rolls and onto each of the mandrels.

774,802. GAS-GENERATOR.—Frank S. Vincent, Petoskey, Mich., assignor of one-half to Royal J. Lyon, Salt Lake City, Utah. The combination of a reservoir; a generator consisting of an upright tubular casing having a spiral formed of sheet metal supported therein; a burner below said generator; a supply-pipe for said burner; a service-pipe; a connecting-pipe from burner supply-pipe to the top of the reservoir; suitable valves and valve connections; an adjustable mixing-tube above nozzle, and means for delivering air under pressure to reservoir.

774,824. PROCESS OF MAKING ALCOHOL AND ALDEHYDE.—Henry S. Blackmore, Mount Vernon, N. Y., assignor to Robert C. Mitchell, Mount Vernon, N. Y. A process of making alkyl hydroxide, which consists in oxidizing hydrogen of hydrocarbon by the action of a solid containing oxygen while maintaining the temperature below the decomposing-point of the alkyl hydroxide desired by refrigeration.

774,828. HOISTING APPARATUS.—Jeremiah Campbell, Newton, Mass. A vertically movable hoisting device, and a stationary hopper adapted to receive the contents of the device, arranged in the line of its vertical travel and provided with a wall which is removable to form a clearance for the hoisting device and which is closed and held closed to form a part of the hopper wall or bottom during the discharge of the contents of the hoisting device.

774,840. METHOD OF MAKING WHITE CEMENT.—Eduard Gogler, Podgorze, near Cracow, Austria-Hungary. A method of making white cement, which consists in mixing in the proper proportion a material containing silicious lime with a material which contains sand, quartz or silicic acid, each as free as possible from iron combinations, adding a quantity of alkalies of from one to three times the weight of the silicates contained in the mixture, making from the whole mixture a raw cement mass, melting the raw cement mass, disintegrating or granulating the molten product, lixiviating the disintegrated or granulated mass in boiling water until its percentage of alkalies is reduced to the proper amount, completely drying the mass, and finely grinding it.

774,869. APPARATUS FOR PREPARING BISULPHITE LIQUOR.—Paul Drewsen and John Parent, Shawano, Wis., assignors to Drewsen-Patent Construction Company, Shawano, Wis. In apparatus for preparing bisulphite liquor, an elongated stationary tank having a substantially flat bottom, a plurality of revoluble agitators in and across the tank near the bottom, and a dam across the tank on the floor behind each of the agitators.

774,919. OPERATING MEANS FOR PUMPS.—Christian F. Mayer, Millersville, Pa., assignor to Pennsylvania Pneumatic Pump Company, Davenport, Iowa. In a lifting and force pump, a one-piece pump-head adjustably secured thereon, a pump-rod extended therethrough, a rack-bar adjustably engaged on said rod, a bearing-face on each side of said rack-bar, a pinion journaled on said head in position to engage said rack-bar, a peripheral band on both sides of said piston extending beyond the teeth thereof adapted to bear on the bearing-faces of said rack-bar and means for changing the point of contact of said pinion on said rack-bar comprising a plurality of sets of radially disposed apertures through said pinion and a handle adapted to engage any of said sets of apertures.

774,930. PROCESS OF REDUCING ORES.—Horace F. Brown, Oakland, Cal. A process of reducing ores as a continuous operation which consists in first passing the ore in a finely crushed or pulverized condition through a non-whirling atmosphere, and then subjecting the highly heated ore to the action of a whirling heated atmosphere moving in the same direction as the travel of the falling body of ore.

774,933. AUGER OR DRILL FOR BORING ROCK, ETC.—Edward Cachelin, Spearfish, S. Dak. An auger or drill having a shank with a coiled lower end, the upper edge of the coil being of greater thickness than its lower, forming thereby an outer rib on said coil.

774,946 MANUFACTURE OF NON-CONDUCTING COVERINGS, BLOCKS, AND SLABS.—Henry C. Michell, London, England. A method of making non-conducting bodies which consists in forming an intimate mixture of mica flakes and silicate of soda, subjecting the mixture to extreme heat to fuse the silicate and chemically unite the elements, and slowly cooling the mass, whereby a dense hard vitreous product is obtained.

774 947. MANUFACTURE OF NON-CONDUCTING COVERINGS, BLOCKS, AND SLABS.—Henry C. Michell, London, England. A method of making non-conducting bodies, which consists in forming an intimate mixture of asbestos and silicate of soda, subjecting the mixture to extreme heat to fuse the silicate and chemically unite the elements, and slowly cooling the mass, whereby a dense hard vitreous product is obtained.

774,958. MANUFACTURE OF STEEL.—Tolmie J. Tresidder, Sheffield, England. Steel containing iron and carbon, manganese, nickel and tungsten in about the following proportions: carbon, 0.28 to 0.32 per cent; manganese, 0.25 to 0.30 per cent; nickel, 2.25 to 2.50 per cent; and tungsten, 0.28 to 0.32 per cent, the remainder being iron.

774,959. MANUFACTURE OF STEEL ARMOR-PLATE, ETC., WITH A HARDENED FACE.—Tolmie J. Tresidder, Sheffield, England. The manufacture of steel plates by first producing an ingot of steel composed of iron, carbon, manganese, nickel and tungsten, and forging, or rolling; then cementing, or supercarburizing, the face and cooling, and afterward restoring the fibrous character to the uncemented part.

774,973. TREATING SCRAP-STEEL AND RECARBURIZING SAME.—Herbert B. Atha, East Orange, N. J. A process of preparing scrap-steel for remelting in an open-hearth furnace, which consists in placing carbon in receptacles and mixing the receptacles with the scrap steel.

774,976. ELECTROPLATING ISOLATED DESIGNS ON VITREOUS SURFACES.—Leon Blower, New York, N. Y. A process of forming an isolated metallic design upon an article having a vitreous surface, which consists in pulverizing the desired metal and mixing it with a suitable flux, applying the said mixture in a paste to the vitreous surface in the desired design, fusing the mixture of pulverized metal and flux upon such vitreous surface, and then increasing the thickness of the fused metal in such design by electrodeposition.

775,004. SEPARATOR.—Calvin T. Freid, West Orange, N. J., assignor to Freid Engineering Company. A separator comprising a casing forming an action-chamber having an air-intake substantially equal to the cross-area of the said action-chamber, and said chamber being provided with a reduced outlet, a series of material-separating devices back of the said intake consisting of vertically staggered horizontal plates upon which the material to be separated is deposited and drops by gravity from one plate to another, means connected with each plate for causing a portion of the material to come to rest upon said plates and form inclines, each incline representing the hypotenuse of a triangle, and causing the mass of the material to move down continuously, but successively in opposite directions from the edges of the respective plates, and means connected with the action-chamber for producing a suction of air through the sinuous sheet of falling material and through the chamber in a direction from the said intake to the said outlet.

775,022. APPARATUS FOR REDUCING METAL BARS TO SHEETS IN PILE IN A HEATED STATE.—Thomas V. Allis, Bridgeport, Conn. In combination with roughing-rolls adapted to reduce bars in a heated state into plates, a roll-conveyer leading from the roughing-rolls to a heating-furnace and adapted to deliver the plates to said furnace at a plane above that of the roughing-rolls, a heating-furnace provided with a throat or inlet opening in alinement with the roll-conveyer, an inclined plate-support having vertical stops for auutomatically registering successive plates into a pile and an exit-door through which said pile may be removed.

775,026. MECHANICAL PUDDLING-FURNACE.—Walter B. Burrow, Norfolk, Va. In a stationary reverberatory mechanical puddling-furnace for making wrought-iron, the combination of a wheeled or roller-supported oscillating and horizontally operated hearth, a concavity in the lining near the bed of the hearth, a projecting overhanging refractory rim or ledge over the said concave lining and the bed, the said rim extending entirely around the inside of the hearth, a lug or arm under the bottom of the hearth, and means for imparting a rocking motion to the arm or lug and the hearth in the direction of its length.

775,031. METHOD OF ELECTRICALLY TREATING MATERIALS.—William S. Franklin, South Bethlehem, Pa., assignor of one-half to Frederick Conlin, Bethlehem, Pa. A method which consists in passing a current between electrodes and through a molten vitreous conductor that only partially fills the space between said electrodes, and causing such materials to pass through the arc formed between one of such electrodes and said conductor and also to pass through such conductor.

775,043. PROCESS OF RECOVERING GOLD AND OXIDE OF IRON FROM SAND.—Thomas J. Lovett, Chicago, Ill. A process of obtaining the values from concentrated gold-bearing iron oxides in a finely-divided condition, which consists in subjecting the iron oxides to the lixiviating action of a suitable chemical solution capable of dissolving the gold without materially injuring the iron, separating the iron and solution, then recovering the gold from the solution.

775,047. BRICK-KILN.—Joseph Sonka and Robert A. Metzner, Seguin, Tex. In a brick-kiln, the combination, with the walls forming separate flues each of which terminates in a contracted passage central of the flues, and the permanent floor forming a driveway flush with the ground-surface and having adjacent double rows of apertures arranged in pairs central of the said walls, of the ducts or channels inclined upwardly and outwardly from each other and connecting the top of the said flues with said apertures.

775,060. PROCESS OF REDUCING ALUMINUM OR OTHER METALS.—Henry S. Blackmore, Mount Vernon, N. Y. A process of reducing metals which consists in fusing a metal oxy-compound, adding an oxy-compound of metal having less affinity for oxygen, subjecting the mass to the action of an electric current capable of liberating the metal having less affinity for oxygen and replenishing the mass with an oxy-compound of the metal liberated and separated as the fused bath is depleted thereof by reduction.

775,068. PULVERIZER.—Albert Raymond, Chicago Ill.; Mary M. Bartelme administratrix of said Raymond, deceased. In a pulverizer, the combinatio with a driving-roller, of a driven roller normally resting upon and rotated by frictional contact with the driving-roller, said rollers, being out of vertical alinement, said driven rollers comprising a plurality of disks each having a central bore, a hub of less diameter than the bore of the disks on which the disks are mounted and have independent radial movement, said hub having longitudinally-arranged bolt-openings disks of smaller diameter than the disks forming the said roller arranged at opposite sides of the latter, and bolts passed through said smaller-diameter disks and the bolt openings in the hub.

775,183. COKE-PULLER.—Harry King, Washington, D. C., assignor to James Ellwood Jones, Switchback, W. Va. A coke-puller comprising an underworking scraper adapted to operate on its instroke to loosen coke for withdrawal and on its outstroke to withdraw loosened coke, a tilting plate pivoted about midway of its length to the body of said scraper and adapted to serve in a forwardly inclined position as a wedging or lifting surface for said scraper and in the oppositely inclined position as a coke grasper or holder, and means for tliting said plate.

775,189. HOISTING, DUMPING, AND TRAMMING APPARATUS.—Nicholas C. Miller, Mineral Point, Wis. The combination of a hoisting-bucket, a tram-car movable to and from the bucket, and means movable with the bucket for positively actuating the tram-car in each direction

775,196 and 775,197. COKE-PULLER.—Frank C. Somes, Washington, D. C., assignor to James Ellwood Jones, Switchback, W. Va. A coke-puller comprising an underworking scraper adapted to operate on its instroke to loosen coke for withdrawal and on its outstroke to withdraw loosened coke, a sliding extension-plate movable on said scraper and adapted to receive and hold the loosened coke which falls thereon on the outstroke, and means under the control of the operator for sliding said plate into extended position to receive coke falling from said scraper on the outstroke.

775,210. LOADING-MACHINE.—Andrew J. Doss, Switchback, W. Va., assignor to James Ellwood Jones, Switchback, W. Va. The combination of a traveling runway, a traveling carriage on said runway, a vertically swinging frame pivoted to said carriage, a shovel pivoted to said swinging-frame and adapted to swing substantially in alinement therewith in raised position, means for swinging said pivoted frame to lower and raise the shovel, and means for reciprocating the carriage on the runway.

775,211. COKE-OVEN-DISCHARGING MACHINE.—Andrew J. Doss, Switchback, W. Va., assignor to James Ellwood Jones, Switchback, W. Va. In a coke-drawing machine, the combination of a track, a coke-puller carriage adapted to travel on said track toward and from a coke-oven, a coke-puller supported on said carriage and adapted to travel therewith to effect the coke-pulling operations, means for reciprocating said coke-puller carriage, and mechanical means on said carriage and under the control of the operator for otherwise manipulating said coke-puller.

775,221. COKE-PULLER.—Harry King, Washington, D. C., assignor to James Ellwood Jones, Switchback, W. Va. A coke-puller comprising an underworking scraper adapted to operate on its instroke to loosen coke for withdrawal and on its outstroke to withdraw loosened coke, a swinging coke-grasper hinged to said scraper and provided with a rigid arm extending downward within said scraper from the pivot of said coke-grasper, and a slide-rod having a pin-and-slot connection with said rigid arm for swinging it into open and closed position.

775,222.—PROCESS OF MAKING ARTIFICIAL BRICK OR STONE.—Louis F. Kwiatkowski, New York, N. Y.—A process of producing artificial stone or brick from a composition including lime and sand consisting in simultaneously incorporating and pulverizing the entire quantity of unslaked lime and part of the sand in its natural moist state, whereby the lime is partially hydrated and the moisture in the sand thereby absorbed and the ingredients thoroughly ground and intermixed, thereafter adding the remaining quantity of sand in its natural state together with sufficient moisture to complete the hydration of the lime, intermixing the ingredients, then molding said mixture, and thereafter subjecting same to the action of superheated salts-impregnated steam under pressure.

775,232. BLUE-PRINT MACHINE.—Henry A. Buchholz and Emil J. G. Rademacher, New York, N. Y. In a machine for duplicating drawings and designs, a stationary support, a conveyer for the material to receive the impression and the material from which the impression is to be made, a curved transparent panel secured to the support in fixed position, the said panel having its lower face convexed and against which the conveyer has tensional engagement, and means located above the transparent panel for supplying light to the same.

775,241. ARTIFICIAL FUEL.—George K. Hollister, Jr., New York, N. Y. An artificial-fluid briquette consisting of a carbon base, clay, a carbonized resin and molasses.

775,265. GAS-PRODUCER.—Henry L. Dixon, Pittsburg, Pa., assignor to H. L. Dixon Company, Pittsburg, Pa. A gas-producer comprising a plurality of adjacent, water-sealed chambers, each pair of chambers having a common, intermediate, vertical wall with grated air-passages on opposite sides thereof, and located solely in the vertical face of said wall, said passages discharging into the corresponding producer-chambers.

775,267. PUMPING AND DREDGING APPARATUS.—George A. Farwell, Boston, Mass., assignor of one-half to Herman L. Winterer, Philadelphia, Pa. The combination of a portable rotary pump of the propeller type, a steam-motor rigidly secured to the upper portion of said pump and connected directly to the shaft thereof to rotate the same, a flexible supply-pipe leading from said motor to its power-supply, and means for freely suspending the combined pump and motor in operative position.

775,275. COKE-PULLER.—Harry King, Washington, D. C., assignor to James Ellwood Jones, Switchback, W. Va. The combination of a coke-puller bar, a coke-puller blade having a pivotal connection with said bar and adapted to swing outward approximately in line therewith to form a wedge-like coke-loosener or to swing substantially at right angles to said bar to form a claw, and means for swinging said blade into its different positions.

775,282. ELECTRIC FURNACE.—Richard Raddatz, Milwaukee, Wis., assignor, by mesne assignments, of nine-tenths to Allis-Chalmers Company. In combina- with a bed or support, a feeding device for delivering material thereto; driving mechanism for imparting motion to the bed and the feeding devices; means for varying the relative movements of the bed and the feeding devices; and electrodes having their ends brought within arcing distance of each other in proximity to the point at which the feeding devices deliver material upon the bed.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week Ending October 29, 1904.

14,398 of 1903. BROMO-CHLORIDE LEACHING.—J. W. Worsey and E. Hoal, St. Helens. Leaching refractory gold ores with bromide of chlorine produced by mixing a chlorate and a bromide with the ore and adding hydrochloric acid.

21,324 of 1903. MAGNETIC CONCENTRATOR.—J. T. Dawes, Prestatyn. Improved shape of belts and drums for carrying the ore to be submitted to the action of magnetic concentrators.

22,410 of 1903. ROCK DRILL. T. Warsop, Coniston. Improved mechanism for percussive rock drills operated direct by petrol motors.

24,806 of 1903. MAKING PEROXIDES.—F. Hinz, Berlin, Germany. Making peroxide of magnesium or zinc by electrolyzing a solution of chloride in presence of peroxide of hydrogen.

25,794 of 1903. IRON-MANGANESE ALLOY.—R. A. Hadfield, Sheffield. An improved iron-manganese alloy for use in making manganese steel, having lower carbon contents than the ordinary ferro-manganese.

25,901 of 1903. COAL-MINING MACHINE.—G. S. Waterfall, Sheffield. In coal-boring machines, making the boring sleeve in two parts longitudinally, which are more easily renewable than if made in one piece.

26,668 of 1903. PRODUCING SULPHATES OF METALS.—O. Meurer, Cologne, Germany. Producing sulphates, copper sulphate especially, by heating the sulphide out of contact with air with a sulphide of an alkali metal, then exposing to the action of warm air which rapidly sulphatizes the sulphide.

4,487 of 1904. ELECTROLYSIS OF SALT.—H. M. Granier, Paris, France. In the electrolytic decomposition of salt, the use of copper as anodes, so that cupreous chloride is produced instead of chlorine, and this chloride afterward converted into sulphate.

16,205 of 1904. ELECTRIC FURNACE.—A. Edelmann and N. Wallin, Berlin, Germany. Improvements in electric furnaces for smelting zinc ores, the object being to prevent the formation of zinc oxide.

SPECIAL CORRESPONDENCE

San Francisco. Nov. 16.

The Ward Shaft Association on November 14 signed a contract for the new pumping plant which is to drain the middle group of mines on the Comstock Lode, Nevada. The successful bidders were the International Steam Pump Co. of the United States, whose works are in New York, and the Westinghouse Electric & Manufacturing Co., of Pittsburg. The contract price was about $80,000. The temporary drainage plant at the Ward shaft will have an air lift to lower the water to the 1,800-ft. level, and from thence down to the 2,500-ft. level other pumps and tailing tanks will be used. The shaft is to be sunk from the 2,500-ft. level—its present depth—to the 3,000-ft. level, where the permanent pumps contracted for will be installed. The Ward Shaft Association is composed of the following mining companies: Gould & Curry, Savage, Chollar, Potosi, Bullion, Alpha Consolidated, Exchequer and Julia Consolidated. These companies own and operate ground nearly a mile in length in the middle part of the Comstock lode, extending from the southern portion of Virginia City to Gold Hill. The middle mines have been flooded for years nearly up to the 1,600-ft., or Sutro tunnel level, but will now be explored at depth when this new machinery drains them.

The contract calls for two first-motion, electrically-driven pumps, each of the units to have a capacity for lifting 1,600 gal. of water per minute, against a pressure equivalent to a height of 1,500 ft., or from the 3,000-ft. level up to the level of the south lateral branch of the Sutro tunnel. Each pump is to be driven by an 800-h. p., slow-speed, inducing motor.

There seems to be an increased interest at present in hydraulic mining, owing, mainly, to the promise of a good water season, but also to the fact it has been proven that many properties could sucessfully work behind impounding works built under the supervision of the California Débris Commission. This commission is pursuing as liberal a course as possible in granting permits to mine by hydraulic process; but at the same time it is prompt in closing down a mine and revoking the license when they find any drainage of moment results from its operations. As it is empowered by act of Congress to do this, its orders can not be questioned. The miners are, therefore, careful to construct their impounding dams and operate their mines in accordance with the ideas and orders of the commission.

The following persons have recently applied for licenses to mine by hydraulic process: J. McGrath, in Red Rock mine, at Howland Flat, Sierra county, draining into Slate creek, which reaches Yuba river; Douglas S. Cone and Charles L. Reynolds, in Smith's Blue Gravel mine, near Ono, Shasta county, drainage into Jerusalem creek, which reaches Sacramento river; O. Engle, in Manila mine, near Igo, Shasta county, draining into Dry creek, which reaches Sacramento river; E. Santirfo mine, near Volcano, Amador county, draining into Grass Valley creek, which reaches Mokelumne river; L. Delucchi and S. Mazzera, in Mazzera mine, near Volcano, Amador county, draining into South Branch Sutter creek, which reaches Mokelumne river; Gold Run Mining Co., in Gold Run mine, near Quincy, Plumas county, draining into Spanish creek, which reaches Feather river, and H. A. and A. A. Hallstead, in Megown mine, near Spanish ranch, Plumas county, draining into Spanish creek, which reaches Feather river.

There is a little excitement in Sutter county over the finding of gold on the Lee ranch, on the border of the Tule basin. The sands and fine gravel found run about $2 per ton. Some of the same kind of material has also been found on the Smith ranch, several miles from the Lee ranch. The sand is found at a depth of from 6 to 20 ft. Arrangements are being made to prospect the ground with drills. Sutter has never been known as a gold region, but has always been inimical to the mining interests. It has, with Yuba county, long been known as the center of the anti-débris interests, which have been fighting the hydraulic miners for years. Now, however, that gold dredgers are increasing in number in Yuba, that county is beginning to think there is something in gold mining after all.

What is known as the Montauk mine case, which has just been decided in the superior court of El Dorado county, is one of great interest to merchants and stockholders and officers of mining companies, as it involves the question of conveyances by corporations to officers of the corporation, to apparently avoid payment of debt. The mine was once a famous producer, and was then known as the Zantgraf, and then became the property of the Montauk Mining Co. Debts were incurred, and it was charged that the mine's income had been illegally used. In April, 1901, W. D. Goodwin resigned as president of the company, and next day received a deed of its property, he having already one-third of the stock. He claimed that he was a creditor to the extent of about $40,000. After the purchase he mortgaged the property to another party, who was already a creditor, and subsequently placed a second mortgage. Later the creditors, who had not been provided for, began suit under the insolvency act of California and the national bankruptcy act, and after suitable proceedings the corporation was declared an insolvent debtor and George S. Dixon was elected assignee. He began suit against W. D. Goodwin for the benefit of the creditors, other than Goodwin. The decision now given is in favor of the California creditors, including a number of Sacramento merchants. The decree of the court is that the deed to Goodwin did not comply with the law regarding transfer of mining property. It orders the deed cancelled, and that the assignee proceed with his duties to make the property respond to the claims of the creditors.

CHAS. G. YALE.

Denver. Nov. 19.

Judge Robert E. Lewis in the district court at Colorado Springs has issued an order restraining Duncan J. MacNeill, the treasurer of Teller county, from issuing deeds for about 200 non-producing properties which are involved in litigation on account of unpaid taxes for the year 1900, the higher courts have declined to assume jurisdiction. The case is an interesting one, affecting the mining industry of the State to a considerable extent. The application for an injunction will be heard next Monday.

It is understood that at the convention of the American Federation of Labor, being held at San Francisco, strong efforts will be made towards a consolidation of that body with the Western Federation of Miners. Although thus far the two have not been affiliated, the different trades unions have during the past year by large contributions towards the latter rendered them considerable assistance, which has created friendly feelings between the organizations, and an amalgamation is looked for.

The race war in the vicinity of Florence has quieted down and the colored miners are working at Coal creek under the guard of deputy sheriffs. The negroes had been driven out a few days before.

Assistant Attorney General Melville filed brief and argument in behalf of Sherman Bell and Bulkeley Wells this week in the contempt case against them under a ruling by Judge Stevens of the district court of Ouray county for failing to obey a habeas corpus writ in the case of Charles H. Moyer then in jail at Telluride. In the brief the attorneys for the State, among other reasons, maintain that as the supreme court had decided that the governor had the right to hold Moyer, the officers of the State militia were obliged to obey him.

Nearly the entire business section of Anaconda, and a large number of residences in that town, about two miles from Cripple Creek, were destroyed by fire a few days ago, and the probability is that the town will not be rebuilt. Most of those burned out will move to Cripple Creek. This fire made the sixth disastrous conflagration in the district, but, fortunately, no lives were lost. The town was built against the sides of a narrow gulch, and was an easy prey to the flames, once they had started.

The abrogation of the switching agreement between the Colorado Springs Short Line and the lines of the Cripple Creek Central, operating the Midland Terminal and the Florence & Cripple Creek lines, will probably cause the construction of a network of railroad tracks. Both companies expect to expend a large amount of money for that purpose. Until now they have extended working courtesies to each other.

The coroner's jury, which inquired into the accident at Tercio, where 19 coal miners lost their lives a few days ago, hold the Rocky Mountain Coal & Iron Co. partially responsible.

The Independent Smelting & Refining Co. has purchased the former Kilton sampling works at Idaho Springs and leased the Gilpin county sampling works at Black Hawk.

Deadwood. Nov. 16.

The machinery for the Ivanhoe Gold Mining Co.'s new mill at Chilkoot camp, nine miles east of Custer City, has arrived at Custer, the nearest railway point, and is being hauled out to the mine. The plant will be put in commission as quickly as possible, and some extensive tests made on the ores. The mill just received has a capacity of about 15 tons a day, and it is the company's intention to operate it for several months as a testing plant, making a series of runs of 100 tons of ore each. By this means, coupled with experiments on the tailing, it is hoped that the proper process for secondary treatment will be determined. The ore contains, in addition to free values, a considerable portion of refractory values, and it is expected that either cyanidation or concentration will be adopted for treatment of the tailing from the amalgamating plates. The management is quite elated over the discovery of platinum in a portion of its ores—one of the very few instances noted where platinum has been found in veins.

A 50-ton sample is being taken from the Bismarck mine, at Keystone, for shipment to a Denver ore-testing establishment.

A new track connecting the little ore railroad with the lower tunnel at the Spearfish mine has been completed, and a steady production will be made from this opening in the future. It is the intention of the management to deliver all the ore through this tunnel—that in the upper contact will be dropped down in shoots which have been arranged. A considerable saving in the cost of mining will be effected by this means. The Spearfish is making a good tonnage record, over 8,000 tons having been treated last month. This is one of the largest amounts ever mined by the company in a similar period of time.

The Hidden Fortune mill, at Deadwood, is now working a double shift, although the plant is not yet running at its fullest capacity. The mill is equipped with 60 stamps, 40 of which are operated during the day and 20 at night. The plant is now handling close to 125 tons a day. A considerable portion of the ore supply is coming from the Bingham workings, where a good grade of free-milling ore is being mined. Steady shipments of Cambrian silicious ore are being made from the south end of the property.

Fire at the Lexington Hill mine destroyed some small buildings at the mouth of the big tunnel and damaged several sets of timbers near the portal to such an extent that they will have to be replaced. The mine will probably be shut down two weeks while the repairs are being made. The tunnel is now in a little over 1,000 ft., and is rapidly nearing quartzite, according to the calculations of the company's engineers.

The Goldstake company's machinery is being installed. It consists of a Fairbanks-Morse gasoline engine, a Crocker-Wheeler generator and Denver Engineering Works box electric drills. The management hopes to resume the work of pushing the tunnel at an early date, as it is anticipated that the machinery will be in running order within a few days.

Experiments are to be made with the Pyatt process at the Maitland mill. The machinery for the installation has arrived and is being installed. It is hoped to have the tests under way within two weeks.

JESSE SIMMONS.

Houghton. Nov. 19.

The Adventure mine has resumed work at No. 1 shaft, the most westerly of its three openings. This shaft has been idle for fifteen months. No. 3 shaft, which has been in continuous operation, is constantly opening better ground, and an increased rock shipment is being secured. The production of mineral, however, is increasing at a faster rate than the output of rock, showing that better ground is stoped. No. 2 is virtually little more than an air shaft, and no resumption there is contemplated. At No. 1 attention for the present will be given to driving a cross-cut from the Knowlton to the Evergreen lode. The shaft is equipped with permanent machinery; four drills are in service. The rock shipments now aggregate about 400 tons daily from the entire mine.

An aggressive policy is being maintained at the Mass, and the force is being gradually increased. It is semi-officially stated that the company has no debts and that the receipts from the recent assessment will all be applied underground.

The Kaukana property, lying immediately west of the Elm river and covering a large acreage, has been optioned to J. C. Watson, of Boston. There are about twenty feeholders. The organization of the Kaukana company was contemplated to explore this property six years ago, but the depression in the price of copper and the abatement of speculative interest caused the project to be abandoned. Included in the property are the Shawmut and Stonington properties, upon which a limited amount of work was done in the early days.

There has been a small amount of surface exploration during the last two weeks, in an effort to identify some of the lodes striking across the property.

Capt. Joshua D. Hosking has been compelled to resign from the superintendency of the Franklin mine on account of his wife's health, and he will remove to California. Richard M. Edwards has resigned from the assistant superintendency of the Isle Royale to succeed Captain Hosking at the Franklin.

The Calumet & Hecla is erecting a shafthouse at No. 20 shaft on the Kearsarge lode. At No. 19 shaft, on the same lode, the Calumet & Hecla is now forwarding rock to the mill. At No. 21 shaft, on this formation, the company is opening a drift on the lode.

Machinery and supplies are being taken to the Miskwabik to resume development there at once.

ARTHUR L. CARNAHAN.

Salt Lake City. Nov. 18.

The indebtedness of the Majestic Copper Co. has been liquidated. A statement issued recently shows that 37 car-loads, or approximately 1,000 tons of ore, were shipped to the Salt Lake smelters in October, the net proceeds from which reached almost $8,000.

Good reports continue to come from the Miller mountain mine, in American Fork canyon, where lessees recently made some important discoveries. Thirty teams are hauling ore from the Salt Lake market, the whole, as it is broken down, averaging from $40 to $50 to the ton. The values run chiefly in lead and silver.

The Ohio Copper Co., operating at Bingham, contemplates the erection of a larger concentrating mill at an early date. The ground owned by the Ohio company contains a large area of copper-bearing porphyries, identical with the class of ores being handled so successfully by the Utah Copper Co. The new plant will have capacity for the treatment of 500 tons a day. Henry Catrow, of Salt Lake, is managing director of the company. The Ohio is now producing 300,000 lb. of copper monthly.

The new tramway recently built at the United States property, at Bingham, which is to convey ores from the Galena mine, has been accepted by the company and is in regular commission.

Concentrate is arriving in the Salt Lake markets daily from the Columbus Consolidated Mining Co.'s new mill at Alta. The product now being shipped is worth about $45 per ton.

Duluth. Nov. 20.

Contracts for new ore dock work for the Duluth, Missabe & Northern road, at Duluth, have been let for about $300,000. No. 3 dock is to be doubled in length and capacity. This is the highest and shortest dock in the company's system, also the newest, and when it was built it was intended to be increased in accordance with the present plans, as soon as conditions demanded. The dock is 67 ft. high, 59 ft. wide and 1,152 ft. long, and has a capacity for storage of 40,320 gross tons. The increase will give the road a storage capacity of 207,000 gross tons. This dock is the highest and widest on the lakes outside No. 2 and 3 of the Great Northern, at the head of the lake, which are 73 ft. high and 62.33 ft. wide. It is found that the increase of high freeboard ships of great capacity demands docks with their load far higher from water than the old types. Contracts for the extension of No. 3 dock of the Duluth & Iron Range road, which is to be constructed, have not been let. This will make the road's total ore dock storage 190,000 tons. The two roads are now in the market for 1,100 pressed steel ore cars, hopper bottom, 100,000-lb. capacity, with 19-ft. wheel base, 24-ft. centers, and will be able the coming year to practically do without wood ore cars. The change will greatly increase the capacity of the roads. They are also in the market for 11 heavy locomotives, standard type.

All these additions, as well as heavy equipment orders that have been made of late, and others that are pending, point to expectation of a very much increased tonnage the coming year. It is not probable, however, that it will reach the 30,000,000 gross tons that many ore men now seem to expect. If it is better than 25 to 26 million tons, it will surprise those who have kept a close touch on the situation.

There is great activity in all raw material productive industries in this part of the country, and iron ore is not the least of these. An instance is found in the re-opening of mines that had been closed for the season, and the revision of estimates for shipment by several of the large companies. The United States Steel Corporation has been exceedingly active all season in getting ore forward, so much so that many looked on its policy in the earlier part of the year as utterly without reason, but it is now revising schedules and will take advantage of the warm weather prevailing to the last limit, and may send ore forward actively to December 1 from many mines. Such companies as the Republic Iron & Steel are increasing their limit, the latter concern by about 50,000 tons. A year ago winter had set in in earnest by November 15; now it is as warm and pleasant as in summer.

Pickands, Mather & Co. are taking several Mesabi explorations under option and are re-examining them for purchase. Their latest option is for a property in section 4—58—05, that had been explored by local men and found to contain about 2,500,000 tons of good ore. The same company has an option on the Tesora mine, near the Stevenson, west of Hibbing, where there are about 500,000 tons shown up, and a larger amount probably to be found of high-grade bessemer ore, very easily mined. Pickands, Mather & Co. are working to increase the ore reserves of the Lackawanna Steel Co. and to put the company into a position where it will be more secure for the future.

Open-pit mines of the Cascade range, near Marquette, have closed for the season. The Moore mine has been most active in this district, and experiments with mining there by steam shovel have been most successful. This method of mining will probably be extended on old ranges the coming year, and arrangements to that end have already been considered at several properties.

The diamond drilling of the White Iron Lake Iron Co., near Ely, has been discontinued, and the drill is moved to Tower. Nothing is now under way on the Vermilion but the work on Section 30, where several drills are driving ahead steadily.

Drills have started operations in Section 10—58—19 for R. Whiteside and associates, who have the land and have made some prior explorations there with no material result.

Spokane. Nov. 16.

The Turk Mining Co., operating in Cedar canyon, Washington, has completed its 100-ton Blanchard smelter, and was to have blown the plant on November 16. An accident prevented, and there will be a delay of two weeks.

The St. Eugene Mining Co. has declared a dividend of two cents a share, payable december 15. That is an addition to dividends of $210,000 already paid. The recent lead bounty of $15 a ton paid by the Dominion government has greatly strengthened the position of St. Eugene. The cash surplus of September 30 was shown at the recent meeting to be $131,000.

The Panhandle Smelting & Refining Co., which is constructing a two-stack lead smelter near Sandpoint, on Lake Pend d'OReille, Ida., has nearly completed its outer buildings, the flume, the water-power and the docks.

The Rambler-Cariboo Mining Co., of Spokane, owning the mine of the same name in the Slocan district of British Columbia, has driven its long tunnel 1,300 ft. The present contract of 2,000 ft. should be finished April 1. The American Boy, in the same camp, also owned by a Spokane company, has two cars of ore ready for shipment. The mine is reported to have struck 16 in. of fine silver-lead ore. George Potter, operating the Blue Bird, is packing down a car of ore. The Ivanhoe is shipping 200 tons of zinc to Batchellor Bros., of Spokane, for shipment abroad.

The shipment of galena ore from the dump at the Last Chance mine, on Deep creek, near Northport, Wash., has been completed and the ore in the upper levels is exhausted. Development in the lower levels will be vigorously pushed throughout the winter. Another payment of $14,000 has been made to the Northport people who gave the bond.

The Apollo company, of New Haven, Conn., owning the California mine near Republic, Wash., has saved the property from sheriff's sale on judgments for debt secured by E. R. Delbridge and T. W. Spellman, respectively superintendent and foreman of the property. Since the mine was closed several months ago, after a misunderstanding between directors, part of the main shaft has caved. Four men under Mr. Case, the new manager, have started repairs.

The Bodie, near Republic, Wash., operated by the Bodie Mining Co., of Spokane, is running its mill and cyanide plant with 25 men.

The Belcher, near Republic, is working a small force of men who have been shipping ore to the Granby smelter. The Copper Key, a near-by gold property on Belcher mountain, is being worked by E. L. Tate, of Spokane. He is making small shipments to Granby.

The Jumbo Mining Co., of Spokane, operating the Jumbo mine at Rossland, B. C., has let a contract to the Riblet Tramway Co., of Spokane, for a 5,000-ft. aerial tram to connect the mine with the tracks of the Red Mountain railway at Rossland. Ore has been hauled at the rate of 500 tons a week in wagons at heavy expense. The tram is expected to handle 500 tons a day. The mine is doing well.

Butte. Nov. 16.

The Colorado Mining & Smelting Co., controlled by the Amalgamated, is closing its smelter for all time. The concentrator was shut down on November 12, and the furnaces of the plant will follow as soon as the concentrate on hand is treated, which will be about November 22. The plant is the oldest in Butte, having been built 28 years ago. It has a capacity of 800 tons of ore per day, but the average daily treatment recently has been 750 tons. Several reasons for closing the plant have been given by the company, one of which is that some of the furnaces are old and out of date, and the expense of replacing them with modern ones will not warrant the outlay. The company has been securing its supply of ore from the Gagnon mine, one of the great copper-silver producers of the district, and various smaller mines under lease. The Gagnon has been undergoing repairs during the last three months. It will be started again about December 1. Its output will be treated in the Washoe smelter in Anaconda and the

Butte & Boston of Butte. James B. Gallagher, who has had charge of the Colorado smelter and mines, will remain with the company, managing the business of the Gagnon, the Taylor & Brunton sampler, recently bought by the Washoe company, and taking care of the abandoned smelter, which will not be dismantled.

Charles E. Morris, of Pony, has been elected president of the Raven Mining Co., operating at Butte, succeeding his father, W. W. Morris, who died while on a mine-inspecting trip through Nevada two months ago. J. E. Oppenheimer, of Butte, has been elected a director of the company, in place of James W. Forbis, who died in Butte a few weeks ago. The Raven company is doing substantial work on its property, its sales of ore averaging between $8,000 and $10,000 per month. Its mines comprise the Raven, a four-sevenths in the Snoozer, and an option on two of the other three-sevenths. The mines are located in the heart of the copper belt. It is now working at a depth of 625 ft. Last week it struck the top of a shoot of copper-silver ore on that level, and is sinking a winze on it. The ore between the surface and the 625-ft. level is silver- and gold-bearing, with some copper. The company intends to sink 300 ft. deeper, believing that 900 ft. will take its workings into the copper zone.

The Garnet Gold Mining Co. has struck a 75-ft. vein of gold-bearing ore in its Galena mine, near Pony, Madison county. The lead is not solid ore, but contains several streaks of rich ore. An assay of 16 ft. of it, made in Butte, gives it a value of $40 per ton. The strike was made through a 1,200-ft. tunnel, which tapped the ore at a depth of 600 ft. The Garnet is a stock company, and is controlled by St. Louis and Chicago men. It owns 13 patented claims, 15 unpatented and a 20-stamp mill, valued at $20,000. The mill has not been operated since the tunnel was begun.

The Indian Queen Mining Co., operating on Birch creek, Beaverhead county, 25 miles southwest of Butte, is making four carloads of copper matte per month and shipping it to the Butte & Boston company, in Butte. Each car contains from 17 to 20 tons. The company has rich ore and is treating it in a 30-ton furnace without concentration.

Bisbee. Nov. 19.

At the smelters of the Copper Queen Consolidated Mining Co., at Douglas, there is much activity, and preparations for an increase in the number of furnaces from five to eight will soon begin. The company has found it necessary to use all its five stacks, and is crowded with work; it does not intend to maintain its full plant in operation, and needs more smelting capacity, hence the decision to increase to eight. This will make it the second copper smelting plant in the United States. At present the plant is turning out about 6,000,000 lb. blister copper monthly, and is treating all the ores brought to it from Bisbee, the entire output of Nacosari concentrate, and some other ores that run through the sampling works. The mechanical mixing beds at this plant are not yet working satisfactorily, but should do so with a few changes in method and manner of handling material. Otherwise the new smelter is giving satisfaction.

At Calumet & Arizona smelter, No. 4 furnace is well along, and No. 5 started, with the machinery plant for the additional capacity sure to be in early in the new year. Probably four furnaces will be maintained in operation, giving about 1,200 tons daily capacity. The two now in use are making about 2,650,000 lb. monthly, and this should be doubled when the addition is running. It is not supposed that the product of Calumet & Arizona mine will be increased, but it is thought that the new capacity will be devoted to ores expected in a short time from Lake Superior & Pittsburg, Calumet & Pittsburg, and Pittsburg & Duluth mines, all of which are nearer to the producing stage than the general public realizes. Cost sheets for Calumet & Arizona production for the past few months run about as in the earlier stages of the company's career, with the difference that a larger number of men is employed in development, which is now proceeding far more rapidly than stoping. The additional development underground includes not only the sinking and equipment of the Oliver shaft, now 1,000 ft. deep, but connecting drifts for ventilation all through the mine, and a search for ores upon several levels. This work, as well as all smelter construction, is all charged against current output, and amounts to nearly a cent per pound on the product.

In statements published by Boston brokers it has been estimated that the two shafts of this mine would be making 60,000,000 lb. copper annually in a year or so. This is probably too high an estimate, for, though the Oliver shaft is soon to be placed on a producing stage, it is hardly likely to mine heavily for some time. A fine double-drum hoisting plant is now being put up at this new shaft.

Calumet & Arizona will close the present calendar year with a surplus of about $1,800,000, largely in copper and supplies. It is carrying about 11,000,000 lb. of copper regularly, and this amount has been increased of late, as the directors have expected a higher price for metal. By the close of this year the mine will have paid in dividends $1,700,000, that is, figuring the coming disbursement at $2 a share, which it probably will be. It is just two years since the first smelter was blown in, and this surplus and dividend payment has been in that period, as well as enough to pay off a debt of $400,000 incurred in smelter and mine construction prior to earnings. In the mine there are many places in drifts where indications present most favorable promise of ore with proper exploration, and these are being attacked as fast as desired. Ore is being found above levels where it was looked for, and the height of the mine is much increased. Rich stopes of glance and other rich sulphides are being cut on various levels. Practically all the work that has been done on the various properties of this group in the way of underground development has been connecting them for passage and ventilation; that is, actual exploration for ore has been subordinate so far. This work of connecting up is now well along, so far as present openings are concerned, and the many stringers and leads cut during its progress will be followed out after orebodies. The results are liable to be of the utmost importance.

The fact that Calumet & Pittsburg pumps are draining Junction shaft, 3,000 ft. northeast, and probably also Lowell shaft, 3,000 ft. northwest, is interesting in its bearing on the probabilities of the ground. Ore in Bisbee is formed along fault planes and in shattered ground, and with such an area of drainage there must be a shattered condition for very considerable distances about the Calumet & Pittsburg. This property is now pumping 2,500 gal. a minute from a depth of 1,000 ft., and is apparently draining the ground as it proceeds, for all water is coming in from the bottom of the shaft. The effect at Junction shaft is five inches a day. When Mr. T. F. Cole was requested by his fellow directors to buy pumps for this shaft, they thought 1,500 gal. a minute would be sufficient; but he thought otherwise and ordered double that capacity, in such units that any one of them would be able to care for the regular flow as it might finally be found to be. The wisdom of his decision is now seen.

Dawson. Nov. 15.

Dredging operations on Bonanza creek and the operation of a steam shovel plant at the mouth of Bear creek were suspended on October 22. The dredging season has been a long and it is reported a satisfactory one, work having been first begun on May 5. At the Bear Creek mine a great quantity of gravel has been moved by the steam shovels.

A new order in council has been passed pertaining to the reservation of certain rights by the crown upon mineral lands to which crown grants have been issued, amending section 53 of the quartz-mining regulations to the following effect: That patents conveying the surface as well as the under rights shall reserve to the crown forever such right or rights of way and of entry as may be required under any regulations in that behalf now or hereafter in force in connection with the construction, maintenance and use of works for the conveyance of water for use in mining operations.

On Sulphur creek active preparations are being made for busy winter working on claims from 56 above to 98 below discovery. The work will be chiefly carried on by individual miners working on lays.

Toronto. Nov. 14.

W. E. H. Carter, of the Bureau of Mines, has returned to Toronto from a tour of inspection in northwestern Ontario. He states that in the Williams iron mine, on the Algoma Central railway, new bodies or bands of high-grade hematite ore have been found in the lower levels. They show a total of 23 ft. of clean ore, in addition to about 10 ft. of second-grade, in a total width of 60 ft. If these bodies prove continuous this area is likely to develop into an important iron field. Promising prospects for iron pyrites and arsenical pyrites have been discovered north of Lake Temagami, and there are a number of other properties of this character in the district which are likely to be investigated soon. At High falls, on the Spanish river, four miles north of the Canadian Pacific railway, the Huronian company, a subsidiary concern of the Canadian Copper Co., is completing water-power works on an extensive scale, having erected concrete dams with a view of developing 11,000 h. p. for present requirements, which may subsequently be greatly increased. It is anticipated that this will enable the Copper company's mines and smelters to be operated next season at a much lower cost. At the Shakespeare gold mine, at Webbwood, a five-stamp mill is being erected, and development work is going on rapidly at the Avon mine, in the same neighborhood.

The water power on the Wahnagritae river, now being developed by Cochrane & McVittie, will be able to deliver power next spring. The machinery is now being installed. In addition to supplying Sudbury with electrical energy for light and water works, it is in contemplation to supply power to the Mond Nickel Co. from this source. This company is pumping its mines, west of Sudbury, free of water, and preparing to resume operations. The Mond company's smelter, which has been used latterly by the Canadian Copper Co. for bessemerizing standard matte, will now be required for the use of the owners.

Victoria. Nov. 16.

The Coast.—Last month's report of the Tyee Copper Co. is an exceptionally satisfactory one, the return being $83,547, after deducting freight and refining charges, on 5,979 tons of ore from the Tyee mine treated at Ladysmith. The right to stake placer ground over a quartz location has been sustained by the recent decision of the full court, sitting in Vancouver, which dismissed the appeal of the Northern Mining Co., through its manager, Mr. Morgan, for a reversal of the judgment of Mr. Justice Martin in the case of Tanghe vs. Morgan et al. In brief, the case showed that a placer miner named Tanghe had staked a claim above the Lucky Jack mine, operated by the defendant company, but had abandoned it to move aside, that he might not interfere with the quartz miners, but as the ground proved very rich, he moved afterward to re-possess himself of the claim, and the court confirmed his right to do so. An electric light and pumping plant has been installed at the Marble Bay mine, Texada island. A depth of 460 ft. has now been reached in the shaft, and the ore reserves have been considerably increased. Values in the lower levels are reported to be well maintained. The Wellington Colliery Co. is installing a washer of large capacity at the Ladysmith colliery. According to reports received through the Canadian commercial agent in Japan, the Japanese naval authorities are experimenting with Comox high-grade bituminous coals with a view to their use on Japanese men-of-war. The coal is held to be equal to the best Cardiff coal, being practically smokeless, and in every respect an excellent steam coal.

Cassiar.—Two companies, the Thibert Creek and the Rosella Hydraulic, have been engaged during the past season in equipping hydraulic mines in this district in readiness for extensive working next year. The Thibert Creek Co. in 1903 made a profit of about 18 per cent, but additional capital has since been secured to render available a greater supply of water for working the property on a larger scale. The Rosella company this past summer also installed plant and built a ditch to carry 1,200 miner's in. of water.

Slocan and Ainsworth.—On the Rambler at McGuigan, over 1,000 ft. have now been driven

in the new tunnel. At present two shifts are engaged at this work. At the American Boy shipments are to be resumed this week, while operations have been resumed at the Idaho mill and the working force at the Ivanhoe has been increased.

There is considerable activity in the Ainsworth district. The No. 1 mine was recently leased, and work started thereon; the Black Diamond Tunnel Co., which is developing a group of properties, expects to begin production next month, and the Highland Company is making large regular shipments of ore.

Monterey. Nov. 16.

It is understood that the organization of a $5,000,000 gold company in New York, for the development of the various resources of the recently purchased old volcano of Popocatapetl, has been accomplished by A. H. Smith, and that the stock will soon be placed on the Eastern market. The grading and building of roads for the work, which includes the mining of the sulphur beds and making the place attractive to tourists, have already been started by Capt. Charles Holt.

Mr. W. C. Greene, of the Greene Consolidated Copper Co., of Cananea, has secured control of the Sierra Madre, and is now trying to obtain from the Mexican government a concession for an extension of the road across the State of Sonora to the port of Agiabampo, on the coast of the Gulf of California. Even if the concession is obtained, however, it is not probable that more of the road will be built at present than will be necessary for the opening up of Mr. Greene's extensive timber lands, unless it seems to him advisable to push on to the coast in order to get the coast trade ahead of the Mexico, Kansas City & Orient, of E. A. Stillwell, which is headed from Chihuahua for the port of Topolobampo, about 50 miles south of Agiabampo. The report that Mr. Greene would resign from the head of the Greene Consolidated Copper Co. to take charge of the Greene Consolidated Gold Co., organized in St. Louis, Mo., with a capital of $5,000,000 gold, to work the placers of the Santo Domingo river, some 30 miles southwest of Cananea, seems to have no foundation. Mr. Greene still remains in charge of the Copper company, but is still able to give the needed time to the installation work of the Gold company, which expects before the end of the year to have the dredges at work on the placer grounds. These dredges will have a capacity of 4,000 cu. yd. per 24 hours, and will work along the river shores of the Santo Domingo river for a distance of 14 miles. It is estimated that there will be earnings of $150,000 gold per month. The Santa Margarita Mining Co., of Cananea, is reported to have struck a rich copper vein, running well in gold and silver, on the Cerro Colorado, near Soyopa. The Hays Consolidated Mining, Milling & Lumber Co., near Quijano, has its 30-stamp mill running. The mines and smelter of the Gold Coin Mining Co., near San Javier, have been started up under the superintendency of E. M. Greenlee.

London. Nov. 12.

A few weeks ago, when referring to Mr. J. H. Fawcett's severance of his connection with the Etruscan Copper Estates, Ltd., I mentioned that, though formerly the directors of that company had boasted loudly of Mr. Fawcett's connection with them, yet they kept remarkably quiet about the subject of his resignation. At the meeting of shareholders, held last week for the purpose of obtaining their acquiescence with the proposals for reconstructing the company and raising additional capital by assessment, the directors were asked for the reason of Mr. Fawcett's resignation, and Mr. Earle, the chairman, said the reason was a purely personal one, and brushed the awkward question aside with the sweep of his arm, as was the custom of his predecessor in the city—Mr. Podsnap—made famous by Dickens. The fact of the matter is that, though Mr. Earle's statement was perfectly true, it was quite misleading. Mr. Fawcett's reason for resigning was certainly a personal one, but it was due to his differing entirely from the policy of the directors. In letters to the board, which he has since made public, Mr. Fawcett gave his opinion that there was not a sufficient and constant supply of copper ore of certain grade to warrant smelting operations on a large scale. To be exact, he said there was not a three months' supply of 2 per cent copper ore, figuring on a furnace capacity of 1,000 tons, and that as the ore is patchy, the prospect of further supplies could not be figured out. The directors did not adapt their operations to his views, so he very properly resigned. We have for some time had independent information about the mine from Messrs. Moreing, Frecheville and Hill, who at different times were commissioned to examine the property. I am inclined to think, however, that Mr. Fawcett's is the most valuable of all, as he had the direction of the developments in the mine for a considerable time. From the above statements made by him it becomes perfectly clear that the ore is patchy and of low grade, and that there is little prospect of obtaining a regular supply of even 2 per cent ore at the rate of 1,000 tons a week. Now that the company's own mine manager has voluntarily resigned, rather than be a party to further waste of money, it is time the shareholders seriously considered their position.

The latest change in management in West Australian mines, and there have been so many that it is hard to keep count of them, is the substitution of Mr. G. M. Roberts for Mr. R. B. Gleisberg as manager of the Associated Gold Mines. Mr. Roberts has been for a year or so manager of the Associated Northern Blocks, the adjoining property, and previously he was metallurgist at Great Boulder Proprietary, under Mr Richard Hamilton. Both the Associated Gold Mines and the Northern Blocks are under the control of Mr. Hermann Landau, whose fight for the control will be remembered by your readers. One of the Associated's directors, Mr. Pierre Ledoux, has recently been at the mine, and has published a report in which he gives a much lower estimate of the ore in the mine than that of Mr. Gleisberg. I do not consider this any reflection on Mr. Gleisberg, for the policy of the directors has been to pick out the best ore, and naturally the value of the balance left in is less than the original estimate of the bulk.

Perth. Oct. 17.

At the Great Boulder Proprietary two further orebodies have been passed through on the 1,900-ft. level. They are 18 in. and 6 ft. in width and assay from 7.5 dwt. gold upward per ton. These, with other recent finds at this, the deepest level, have satisfactorily proved the continuation of the main lodes. Opening out at this level is now proceeding. The three leases of the Oroya-Brownhill are supplying ore well up to average, and especially rich ore, as usual, from the Oroya north lease. At the north end of the latter block the rich body of ore now exposed is valued at £750,000. It is said to be the richest bonanza ever opened up on this field.

The Associated Northern is looking very much better, and ore now blocked out is estimated as sufficient for 18 months' supply to keep up present monthly average, or a profit in sight of £150,000. The company has also large cash reserves in hand. Some important developments are being made in the Boulder Perseverance.

Some rich pockets continue to be found at Coolgardie. The Big Blow lessees are getting rich ore. The Lindsay leases crushed 180 tons for 1 oz. gold per ton, and the owners have also obtained 60 oz. of coarse gold by dollying.

On the Reward Extended lease at Southern Cross a quantity of very rich ore has been raised, worth 3,000 oz. per ton, and the formation appears to be a part of the main reef. The quartz is loaded with gold. This old district is going ahead again, and proves how great an area remains still for prospecting near at hand, without going into the back country. The Greenmount mine is raising ore from a reef varying from 2 ft. to 15 ft. wide, and worth about 15 dwt. per ton. At Norseman, the Princess Royal is looking very well; the main shaft is down to 464 feet.

The South Gippsland leases, at Vosperton, treated 400 tons for a yield of 438 oz. of gold in September.

The Mount Margaret goldfield is going ahead with phenomenal rapidity. The center of Laverton, the present terminus of the railway, is looking remarkably well. The Lancefield is steadily increasing its returns with its new 40-head mill, and several other mines near are opening up well. To the north the whole country to Duketown, through Erlistoun, looks exceedingly promising, and must soon attract a great deal of attention.

Johannesburg. Oct. 24.

The experiments which have recently been conducted with the tube-mill have been most successful, and promise an increased stamp capacity, with a greater percentage of recovery at a very low cost, which has not yet been definitely stated, pending more exhaustive experiments. When it first became known that a duty of 10.8 tons per stamp had been attained by the use of tube-mills at the Glen Deep, some enthusiasts prophesied the most marvelous results. After careful trials, however, the most that is promised us by the use of tube-mills is an increase in stamp-duty from 5 to 5.5, with an added extraction of 5 per cent at a very low cost. Thirty-one tube-mills are on order for the Rand Mines group, in addition to the one already in use at the Glen Deep, which means that one tube-mill for every 48 stamps in use is about to be installed. At the Robinson Central Deep, with 50 stamps, the management intends to install three tube-mills, and the engineer in charge is confident that he will double the capacity of the mill thereby. Evidently, there is considerable divergence of opinion as to the effect of this innovation. In regard to the cost of laying down tube-mills, it is interesting to note that at the last meeting of the Glen Deep company the chairman declared that while the cost of the erection of two tube-mills would be only £14,000, it is estimated that to add the necessary number of tube-mills and plant to obtain the same crushing capacity as an extra 100 stamps will cost £110,842, as against £146,460 for the additional 100 stamps with full equipment. It is not the mere crushing machinery, in fact, that costs the money, but the huge erection necessary for an ordinary cyanide plant, and in this connection there is a growing feeling among metallurgical engineers that our next big advance will be the introduction of a really efficient filter-press, which will enable the sliming of the entire pulp from the mill to become an economic possibility, as it has been proved that the gold in very finely crushed 'banket' is almost immediately soluble in cyanide solution if reasonable precautions have been taken to catch all coarse gold by amalgamation. An objection to very coarse crushing in the mortar box of the stamp battery is the scouring effect which the coarse pulp is bound to have on the plates, but to this objection the advocates of the sliming process reply by pointing out that all this coarse gold could be caught in amalgamating pans. It is not improbable, therefore, that five years hence the very coarsely crushed pulp will be fed straight into tube-mills and the fine pulp from them run straight into amalgamating pans, where the coarse gold will be caught and all remaining coarse sulphide and sand reduced to the condition of slime. The resultant slime will then be agitated for two or three hours with cyanide solution and then forced through filter-presses, from which the resultant waste will be recovered in solid blocks containing about 25 per cent moisture. The question as to further washing of this product will be a matter to be decided by practical experiment, as this washing may be done either in the original filter-press or after the solid blocks have been re-mixed with water and re-pressed. Some very interesting experiments have recently been conducted on one of the mines here which have not yet been officially made public, but some of the gentlemen connected with the experiments maintain that by means of an improved filter-press they can press and discharge three-fourths of a ton of caked slime in 15 minutes and have the press ready for work again at the end of that time. This would mean that one of these machines could take the product of 10 heavy stamps, and the saving in the cost of installation of cyanide plant would be enormous. It is too early as yet to speak positively about these experiments, but it can at least be said that as regards the probability of marked improvements in the treatment of our gold ore, the future is full of hope.

PERSONAL.

Mining and metallurgical engineers are invited to keep the ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. Ben S. Revett is at Denver.

Mr. Arthur Winslow is at Boston.

Mr. E. Gybbon Spilsbury is at Salt Lake City.

Mr. Leon Dominian is in the State of Sonora, Mexico.

Mr. Frank H. Probert, of Los Angeles, is in New York.

Mr. R. M. Atwater, of Helena, Mont., is in New York.

Mr. George I. Gleason, of Denver, has been in Salt Lake City.

Mr. Godfrey D. Doveton, of Denver, is at present in Nevada.

Mr. H. L. Lawrence has returned to London from South Africa.

Mr. William Yolen Williams is visiting his old home in Wales.

Mr. Thos. G. Davey is on his way from Rhodesia to England.

Mr. W. A. Pomeroy is on his way from Kalgoorlie to this country.

Mr. J. M. Callow has returned from San Francisco to Butte, Montana.

Mr. C. S. Herzig writes from Mandalay, in Burma. He is returning to Melbourne.

Mr. E. A. Weinberg, of London, arrived in New York on his way to San Francisco.

Mr. Edgar Rickard, manager of El Progreso Mining Co., Mexico, is visiting New York.

Mr. W. H. Kempton, of New York, has gone to California on professional business.

Mr. T. L. Wickson has been examining properties in the southern Oregon copper district.

Mr. George R. Sims has returned to Syracuse, N. Y., from a prospecting trip in Nevada.

Mr. F. C. Alsdorf, of Clifton, Ariz., was in New York, and is now on his way to Nevada.

Mr. Edward L. Dufourcq has returned to New York from a professional trip in Mexico.

Mr. Duncan McVichie, manager of the Bingham Consolidated Mines, of Utah, is now in Boston.

Mr. Miltiades Th. Armas, of Paris, passed through New York on his way to La Paz, Bolivia.

Mr. E. L. Godbe has been examining the old Bullionville tailing dumps, at Bullionville, Nevada.

Mr. W. S. Jenkins has resigned as manager of the Idaho-Alamo mines, at Sandon, British Columbia.

Mr. G. M. Roberts is now manager of the Associated Gold Mines, at Kalgoorlie, Western Australia.

Mr. Arthur R. Mynott has been appointed assistant manager of the San Albino mines, in Nicaragua.

Mr. M. S. Beal, formerly at Cripple Creek, is now at Los Vegas, Nev., on the line of the Clark railroad.

Mr. T. Lane Carter has returned to Johannesburg after a long exploratory journey in northern Rhodesia.

Mr. Hedley D. Crowder has been appointed superintendent of the Victoria y Anexas mine, at El Oro, Mexico.

Mr. Edward H. Kraus has been appointed assistant professor of mineralogy at the University of Michigan.

Mr. Frederick H. Minard, of Denver, was in New York during the week, and is now on his way to Ouray, Colorado.

Mr. J. D. McKenzie, of Chihuahua City, Mex., has gone to the Cerro de Pasco mines, at Cerro de Pasco, Peru.

Mr. Newton Booth Knox sailed from San Francisco on November 15 to examine concessions in Japan and Korea.

Mr. Curtis L. Knight, of the staff of the Western Exploration Co., has recovered from an attack of typhoid fever.

Mr. W. E. Bloch, of the Boston Consolidated mine, of Utah, has returned to Salt Lake City from New York.

Mr. W. T. Frazier, superintendent of the Alder Creek Gold Mining Co., is examining copper properties in California.

Messrs. Thomas Cornish and Fred C. Bodfish have been examining the Theresa mine, at Colorado Springs, Colorado.

Mr. E. C. Engelhardt has returned to Denver after an absence of two months in Gilpin county on professional business.

Mr. A. C. Garde, for the past three years manager of the Payne mine, at Sandon, British Columbia, has resigned that position.

Mr. W. H. Kinnon has returned to Denver from a six weeks' professional trip in La Plata mountains, in southwestern Colorado.

Mr. Willard N. Sawyer has been appointed general manager of the Lake Superior Corporation and its subsidiary companies.

Mr. Louis Moore, president of the United Bingham Mining Co., of Utah, has been inspecting the properties of the company.

Mr. Reginald P. Rowe has been elected vice-president of the National Lead Co., to succeed Mr. John A. Stevens, who has resigned.

Mr. G. W. Maynard, of New York, starts this week for Arizona on professional business. He expects to remain there for several months.

Mr. Robert E. Miller, special representative of the Magnolia Anti-Friction Metal Co. of Great Britain, Ltd., has been visiting the exposition at St. Louis.

Mr. R. B. Green, formerly chemist for the Minnesota Iron Co. and for the United States Steel Co. in Minnesota, is now at the Sumpter smelter, Sumpter, Oregon.

Mr. J. D. Kendall, formerly resident partner in British Columbia of Messrs. Bewick, Moreing & Co., has been examining the Slough Creek mines in British Columbia.

Mr. E. Jacobs is visiting the chief mining camps of West Kootenay and the Boundary for the purpose of obtaining information for a review of the mining industry in 1904.

Mr. F. O. Harvey, consulting engineer to Mason & Barry, Ltd., of London, has been appointed consulting engineer for the San Miguel Copper Mining Co., Ltd., in Spain.

Messrs. R. G. McConnell and F. H. MacLaren, of the Geological Survey of Canada, who have been in the Alsek country, Yukon Territory, have returned to Ottawa for the winter.

Mr. George J. Rockwell is not connected with the Allis-Chalmers Company, as recently stated in this column. He is simply one of the many who occasionally have mail addressed in care of this company.

Mr. Joseph Wilson Swan has received the honor of knighthood. Mr. Swan's interests range over many subjects, such as incandescent lamps, photographic dry plates, electrochemistry and electrometallurgy.

Mr. A. A. Blow has severed his connection with the Smelting & Refining Co. of Australia, Ltd., and intends to devote himself mainly to American and Mexican practice, making his headquarters in New York.

Mr. Willard B. Preston has resigned his position with the Mine & Smelter Supply Co. and has returned to the employ of the Denver Fire Clay Co., with which concern he was previously connected for several years.

Mr. R. B. Green, who for a number of years was chemist for the Minnesota Iron Co., at Two Rivers, and later chemist for the United States Steel Corporation, at Eveleth, Minn., has accepted a position with a smelting company at Sumpter, Oregon.

Mr. H. G. Graves, for many years the organizer of the old students' dinners of the Royal School of Mines, has been appointed Comptroller of the Indian Patent Office, at Calcutta. For the past 20 years he has been examiner of mining and metallurgical patents at the British Patent Office.

Mr. Henry C. Holthoff has resigned as vice-president of the Power & Mining Machinery Co., of Cudahy, Wis., and will retire from the business about December 1. Mr. Holthoff was one of the organizers and the president of the Holthoff Machinery Co., which was later absorbed by the former company.

OBITUARY.

Frank Hitchcock Clemons, manager and treasurer of the Wyoming Coal & Land Co., died at Scranton, November 13, aged 47 years.

William Arthur Heywood, general manager of the Pennsylvania Iron Works, Philadelphia, died at his home in Philadelphia on November 13, aged 38 years. Mr. Heywood was a prominent member of the American Society of Mechanical Engineers. A widow and two sons survive him.

C. A. Parker, second vice-president of the Cincinnati, Hamilton & Dayton railroad, vice-president of the Pere Marquette road, and vice-president of the Colorado Fuel & Iron Co., died suddenly on November 16 at Cincinnati. The cause of death is thought to have been heart disease.

C. A. Nolan, one of the recent developers of the Birmingham district, Ala., died during the past week, after an illness of several weeks. Mr. Nolan was interested with the Messrs. McCormack and Ramsay in several industries in that district, and especially in the coal mine development.

W. S. Lang, superintendent of the Tennessee Coal, Iron & Railroad Co.'s mines at Blocton, Ala., died during the past week from a rifle wound inflicted by some unknown person, who fired from ambush on the evening of November 12. The Tennessee company has offered a reward of $5,000 for the arrest and conviction of the person who fired the shot which caused his death. Detectives are now working on the case.

We regret to chronicle the death—on October 25—of Theodor Fleitman, the noted German expert and manufacturer of nickel. In his early years Fleitman studied under Will, Rose, and Liebig, and was for a time assistant to the latter. His chemical training, which covered even the organic field, did not seem to incapacitate him for its application in metal making, where he was remarkably successful both in a technical and a commercial way. He was born 1828.

SOCIETIES AND TECHNICAL SCHOOLS.

Society of Chemical Industry.—At the meeting of the New York Section at the Chemists' Club, on November 25, the following papers will be read: 'A New Caustic Soda Process,' by Hans A. Frasch; 'The Determination of Rosin in Shellac,' by A. C. Langmuir; 'The Routine Analyses of a Silk Dye-house,' by Gail Mersereau; 'The Use of Tannic Acid as an Aid in Determining Alumina,' by Robert E. Divine.

TRADE CATALOGUES.

'Superheated Steam' is the title of a circular issued by the Power Specialty Co., of New York.

Facts about the lubrication of axles and the application of Dixon's everlasting graphite axle grease are set forth in a booklet issued by the Joseph Dixon Crucible Co., of Jersey City, N. J.

The National Wood Pipe Co., of Los Angeles, has compiled some extracts from its 'log book,' being testimonials from enthusiastic users of its products. The book is handsomely illustrated.

A large, complete and handsome catalogue, No. 35, has been prepared by the S. H. Supply Co., of Denver, Colo. It contains descriptions of the large stock of machinery on hand at the company's depot, with price-lists and illustrations.

The Crane Co., of Chicago, has issued a handsome illustrated special catalogue of Crane's patent 'pop' safety valves, water relief valves, cylinder relief and snifting valves, and hydraulic relief valves. In writing for this ask for special catalogue No. 100.

A special steam-head for operating deep-well pumps is described in Bulletin L-602, published by the Laidlaw-Dunn-Gordon Co., of New York City. This device is designed for pumping from all classes of wells where it is necessary to place the pump cylinder far below the steam cylinder.

INDUSTRIAL.

The United States Government has just purchased from the Rand Drill Co. 27 Imperial pneumatic hammers and drills. These are to be used in connection with the Manila harbor improvements.

The Colorado Iron Works Co., of Denver, Colo., reports the sale of one set of its 36"x16" improved standard wide-faced crushing rolls to the Traylor Engineering Co., in New York, and of five of its impact screens to Messrs. Caird & Hawksworth, of Helena, Montana.

The International Jury of Awards at the Louisiana Purchase Exposition in St. Louis, has awarded gold medals to the Weber Gas & Gasoline Engine Co., of Kansas City, Mo., on its Weber gas engines and Weber suction gas producers. The gold medal is the highest award made by the International Jury.

The S. H. Supply Co., of Denver, Colo., reports recent sales of a 50-ton concentrating plant to Vancouver, B. C., and a 75-ton concentrating plant placed at Hailey, Idaho. Both plants are using rolls. A 10 and 20 stamp mill has been sent to Mexico, and a 25-ton cyanide plant to Lordsburg, N. M.; a 20 by 60 Fraser & Chalmers double-reel Corliss hoist to Merrellos, Mex.; a copper-leaching plant to Salida, Colo.; 10 stamps to Breckenridge, and a 20-stamp mill, complete, to Boulder county; a 50-ton stamp concentrating plant for concentrating of tungsten ores in Boulder county; a complete copper-smelting plant, 36 by 140, to Arizona, and a 5-drill compressor plant to Leadville, Colorado.

The firm of Rogers, Brown & Co. announces that Messrs. E. L. Billingslea, J. K. Pollock and W. T. Shepard have been taken into the firm. Mr. Billingslea has been the manager of the Chicago office for a number of years, and Mr. Shepard has had charge of the Buffalo office for a long time. Mr. Pollock has been connected with the company, and was also associated with Mr. Meacham prior to his connection with the firm. They are all well known to the trade and are men of wide experience. The firm now is composed of the following members: Wm. A. Rogers, Buffalo; D. B. Meacham, Cincinnati; M. Cochrane Armour, Chicago; A. A. Fowler, New York; E. L. Billingslea, Chicago; J. K. Pollock, Cincinnati; W. T. Shepard, Buffalo.

The Wellman-Seaver-Morgan Co., of Cleveland, Ohio, was recently awarded the contract to construct two large coal-handling machines for the Boston Coal, Dock & Wharf Co., of Duluth, Minn. This is one of the docks under the management of the St. Paul & Western Coal Co., of which Mr. M. J. Patton is superintendent. The machines will consist of two conveyor bridges, each about 350 ft. long, including front and rear cantilevers. The machines will be designed so that coal may be screened and loaded into box cars, as well as unloaded from vessels, and will be built to be operated by steam. They will be equipped with 2-ton Hulett patent excavating buckets and machinery designed to give maximum speeds of operation. The structural work will be of steel throughout, and the machines will be self-propelling along the dock.

Three Westinghouse 62.5-kw. engine type generators, which have been in service in the basement of the New England building, in Cleveland, Ohio, have recently been subjected to a test which shows up Westinghouse construction in a very good light. A fire occurred in the basement where the generators were installed and completely burned away the insulation on the outside of the field coils. The fire department played upon these machines with six lines of hose for one hour. Within one hour from the time the water was turned off the machines one of them was in operation and carrying its full rated load. The second machine was put in operation later, and carried its full rate load, and at the present time two of these machines are operating under the load normally carried by all three of them. The fire-proof insulation of the field coils withstood the fire perfectly even though the outer protecting coverings were entirely consumed, and the heat was so intense as to burn and blister the finish on the frames. Electrical machinery, as usually constructed, is scarcely expected to stand a fire and water test, but it appears that such a guarantee might have been made on these generators.

GENERAL MINING NEWS.

Mineral Oil Exports.—The United States reports exports as follows, in gallons:

	October.	January–October. 1904.	1903.
Crude	9,296,012	81,303,974	100,226,352
Naphthas	2,950,540	17,519,105	9,695,597
Illuminating	67,342,450	629,369,135	549,165,283
Lubricat. and paraf.	8,162,562	69,349,010	77,924,189
Residuum	3,744,573	26,298,456	6,229,692
Total gal	91,496,137	823,839,680	743,241,113

The increase this year is equivalent to 80,598,567 gal., or 10.7 per cent, principally in illuminating oil and residuum.

ARIZONA.

COCHISE COUNTY.

Paradise District.—The Chiricahua Development Co. has encountered spots and small bunches of copper sulphide ore in the lime through which it is sinking its main shaft. The strike is of itself unimportant, except so far as it shows indications of an orebody no great distance ahead of the present depth of 320 ft. At the Mexican group, S. S. Badger, who is in charge, is having the property surveyed, preparatory to beginning development work. This group lies about 4,000 ft. directly south of the Chiricahua Development Co.'s property. The ledge intrudes through the porphyry and lime, and, as exposed by the croppings, is 50 ft. wide. It is characteristic of the district, being heavily capped by iron ore. The development so far done is a shaft 20 ft. deep and several open-cuts. Sinking of the shaft will be continued and a cross-cut run to get a further depth under the shaft of 200 ft. At the Mayflower group, owned by Capt. John A. Duncan, which lies between the Chiricahua Development Co.'s property and the Mexican group, it is reported that work is progressing, with encouraging outlook. The contact of porphyritic granite was cut by a tunnel 115 ft. long, at a depth of 100 ft. from the surface, disclosing a ledge of about 35 ft. in thickness of a quartz porphyry, containing iron and copper carbonates, from which a sample carload was shipped, returning 16 per cent copper. A cross-cut was then started 100 ft. below the upper adit. This cross-cut is now in 200 ft., and is within about 10 ft. of the ledge. Mr. J. H. McClelland is in charge of the work. There are 17 claims in the group. Gallon and Forest, while doing their assessment work on the Calico group, a little less than a mile east of Paradise, opened what appears to be the top of an orebody of some magnitude. The ore is a silicious lime, carrying copper carbonate, silver, gold and galena. At the Scanlon group, on Harris mountain, two miles east of Paradise, Messrs. Scanlon and McClelland have erected a horse-whim over the main shaft, which had a depth of 60 ft. They are now 10 ft. deeper and have encountered a body of high-grade copper ore, the extent of which is not yet known. The ore is a quartz, carrying copper sulphide and iron pyrite.

At the Black Queen group, owned by George A. Walker and George Meyers, which is located one mile east of town on Silver creek, assessment for this year is nearing completion. This property, consisting of 10 claims, is in the lime belt and has the contact running through it. The vein, as so far exposed, is over 20 ft. wide, with a hanging-wall of porphyry and footwall of lime. The ledge matter is a quartz porphyry carrving iron pyrite, copper, silver and gold. The assays show returns of from 3 to 20 per cent of copper, from 1 to 6 ounces of silver, and from a trace to $2 in gold. The gangue also carries some lead. The property is so far developed by 200 ft. of work. The main work is in a shaft 50 ft. deep, with a cross-cut of 20 ft. to the footwall, and they are now at work crosscutting to reach the hanging-wall, so as to determine the width of the vein.

MOHAVE COUNTY.

Monmouth.—The Monmouth Mining & Development Co., of Monmouth, Ill., has for some time been developing its property on Burro creek, in the southeastern part of this county. The property is on the east side of the Hualapai mountains, and in the Aquarius range, 75 miles southeast of Kingman. Burro creek is a tributary of Bill Williams fork, the latter flowing into the Colorado. The group covers a wide vein, striking northwest-southeast, having a dip of 55° from the horizontal. The vein consists of a body of quartz and spar, from 40 to 100 ft. in width, standing between a porphyry hanging wall and a greenstone footwall. The gangue rock carries gold, running from $7 to $12 per ton, as shown by ton-lot tests, the gold being in free but extremely fine particles. Tests made in Denver demonstrate the adaptability of the ore to cyanide treatment, and the matter of erecting a plant for this purpose is being considered. Dr. J. P. Wallace, general manager of the company, states that there are no sulphides in the ore as thus far disclosed by over 1,000 ft. of development that has been done. The vein runs longitudinally with a mountain spur, and the vein is opened by cross-cuts from both sides of the ridge, the longest of these giving a depth of 400 ft. on the vein. Burro creek, at the base of the ridge, flows a constant volume of water, which may be utilized for power purposes.

CALIFORNIA.

AMADOR COUNTY.

Elliott.—This mine, near Oleta, has been purchased by Samuel K. Thornton, formerly manager of the Shenandoah. It is an extension of the old Cooper mine and is partly developed by a 150-ft. tunnel.

CALAVERAS COUNTY.

Chili Gulch District.—At the Rooney mine, W. H. Carnow, superintendent, the mill is crushing $3 gravel. The What Cheer is employing 20 men, under superintendent Henry Birch. The New Buffalo has been purchased by Squires & Hawes, with Joseph Oneta as superintendent, and 15 men at work. Grading for a new hoist and mill has been completed. At the Hanby mine a three-compartment vertical shaft is being sunk by J. E. King, who has a bond on the property.

EL DORADO COUNTY.

Kelsey.—Development work has been resumed on this mine and a three-stamp mill has been installed. The patent of this mine covers ground from the American river above Chili Bar to the Big Sandy mine near Kelsey.

KERN COUNTY.

Corona Mining Co.—This company at Randsburg owns a group of three mines on which it is about to install machinery.

NEVADA COUNTY.

Blue Tent.—At this mine, Blue Tent, Clifford Graham superintendent, the breasting is being done north of the 1,550-ft. bedrock tunnel. The 20-stamp mill is being kept busy day and night.

Chicago.—This mine, which has been idle many years, has been started up under superintendency of W. P. Martin.

Canfield.—A 10-stamp mill is being built at this mine (formerly the Grizzly Flat), on the South Yuba river, near Blue Tent. The mine was formerly worked by hydraulic process, but will now be drifted. Charles Graham is superintendent.

Jenny Lind Mining Co.—This company has contracted to have an upraise of 100 ft. or more to tap the gravel channel.

Mohegan Mining Co.—This mine on Mud flat, adjoining Gold flat, is to be reopened and developed. The old shaft is to be re-timbered. John T. Morgan is president.

Union Consolidated Mining Co.—Several carloads of pumping machinery have been received at this time. The three-compartment shaft is now down to the drain tunnel and is to be deepened. The drain tunnel is being reopened.

PLACER COUNTY.

Golden West.—This property at Canada Hill, recently closed down, is to resume work at once, with F. P. Armstrong as superintendent. They expect to strike the channel shortly.

RIVERSIDE COUNTY.

George Lord has found a deposit of graphite in Bear canyon, a few miles south of Corona.

SAN BERNARDINO COUNTY.

Seal of Gold Mining Co.—This company at Dale has provided itself with tank wagons to haul fuel distillate from Amboy to the mines.

SAN DIEGO COUNTY.

Ballena.—D. D. Bailey of Banner, M. Jacoby of Julian, F. R. Sawday, of Ensenada, and M. Barnett of Los Angeles, have finally completed a 1,400-ft. tunnel to connect with a ditch from the Santa Ysabel river to bring water on the ground.

Boulder Creek Mining Co.—The new Lane mill at this mine, Boulder creek, with a capacity of 20 tons daily, has been put in place and will be running as soon as more water is developed.

Cuyamaca Ranch & Mining Co.—A 300-gal. automatic dip tank has been provided for use in connection with the pumps in unwatering the Stonewall mine of this company at Cuyamaca.

Oroflamme Mining Co.—At this mine, near Banner, the mill has been overhauled and men set at development work.

Oro Blanco Mining Co.—Work is again being pushed on the tunnel of this company at Julian, now in about 1,200 ft.

SANTA BARBARA COUNTY.

Union Oil Co.—This company has brought in two more fine gushers on its property, near Lompoc. The wells are from 2,300 to 2,500 ft. deep in good oil sand.

SANTA CLARA COUNTY.

Davey Mining & Investment Co.—This company has been incorporated at San Jose with the following directors: W. M. Davey and D. W. Starrett of Oakland, A. L. Leonard and C. N. Nicholson of San Francisco, and Thomas H. Dye of Contra Costa County. The object of the company is mainly to develop and operate the Guadalupe quicksilver mines, on which Mr. Davey has an option of purchase and a lease.

SISKIYOU COUNTY.

Mount Vernon.—The mill at this mine, Cherry Creek, is running steadily on ore taken out the past summer. The mill is being run by electric power.

TRINITY COUNTY.

Fairview Mining Co.—It is expected that within a short time the 30 stamps of the new mill at this mine, Minersville, will be dropping. Twenty stamps are now working and a new dynamo has been installed.

Quimby Gold Mining Co.—This company has three gangs of men at work on the trail to the mine, and 25 men at work on the ditch. A new plant is being installed.

TUOLUMNE COUNTY.

Horseshoe Bend Mining Co.—This company has bought a 10-stamp mill from a mine in Placer county, and has also purchased the new mill at the Altadena, and will soon have 40 stamps dropping.

New Albany.—A large body of good ore has been opened in this mine, and William Connelly has rebonded the claim to Bunting & Co. at an advance over the original bond price.

New Calico Mining Co.—This company has six men at work on the Lucio ranch near Stent. A steam hoist has been placed at the shaft.

Ranch.—Final payment of $500 has been made to Doyle Bros. for this mine.

Ranch and Clark.—James Shaw has decided to increase the capacity of the machinery at these gravel claims and operate them on a larger scale.

Star Mining Co.—An Ingersoll-Sergeant air compressor, with a Pelton wheel, has arrived for this mine.

COLORADO.

BOULDER COUNTY.

Bird's Nest.—Denver lessees on this property near Eldora have opened up good ores in the 100-ft. level, the smelting streak carrying values of from $100 to $300 per ton. A small streak of tellurium ore, averaging 1 in. wide, carries values of up to $100 per pound, and a shipment will soon be sent out. B. T. Brooks, of Eldora, is manager.

CLEAR CREEK COUNTY.

During the past month the shipments from the Idaho Springs station of the Colorado & Southern road to the valley smelters consisted of 244 cars, or about 5,000 tons of smelting ore and concentrate, being an increase of 128 cars, or a gain of 110 per cent over the corresponding month for the previous year.

Independent Smelting & Refining Co.—This company, operating the pyritic smelter at Golden, has made arrangements to purchase the Kilton sampling works at Idaho Springs, and it is being refitted and will be ready for the sampling of ores soon. John H. Kemp, Idaho Springs, has been appointed manager of the plant.

Gold Anchor Mining Co.—Eastern owners have arranged to sink 200 ft. deeper, or to the 450-ft. point, and they will erect their own mill next spring for the treatment of their own ores. I. Slater, of Alice, is manager, and the property is located in the Upper Fall River district.

Ward.—Arrangements are being made for installing a cyanide process at this mill at Idaho Springs, and a new 60-h. p. electric motor has been ordered for motive power. The alterations and improvements will increase capacity to 100 tons per day. M. W. Tanner, Idaho Springs, is manager.

GILPIN COUNTY.

Cotton.—A streak of high-grade ore has been found in the 450-ft. workings from the Nemeha shaft, showing an unusual occurrence in lead and carrying free gold. Assays run up to 40 oz. gold per ton. A recent shipment gave returns of 14 oz. gold. E. S. Moulton is owner, the property being worked under lease.

Dougherty.—Local parties have taken a lease and bond on this property in Illinois Central and Lake districts, and are taking out some very good grade surface ores. The property is credited with a production of $50,000 from surface diggings alone, and the lessees will sink a shaft in the gulch side of claim and will install machinery and put up buildings. Gus Bensel is in charge of operations.

Eldorado.—A recent shipment of 50 tons from this mine cleaned up by amalgamation 22½ oz. of gold and made 12 tons of tailing worth $15 per ton. The ores came from below the 100-ft. level. The company will install gasoline hoist and erect shaft buildings. S. T. Harris is superintendent.

Gold Dirt Mining Co.—The stockholders have decided to erect a milling plant of their own in Gambell gulch, near Perigo, the plant to be about 50 tons daily capacity and to treat the output from this property.

Notice.—Dr. Lambert, of St. Louis, is reopening this property in Lake district, and erecting a new shaft building. He will install a 20 or 22-h. p. gasoline hoist and will carry on active developments. L. B. Smith is superintendent.

Sutton.—Eastern parties are interested in a lease and bond and are installing a plant of machinery and erecting top buildings on the Morris shaft, which is down 200 ft. H. G. Pearce is manager.

Town Topics Gold Mining Co.—This company operates its property entirely and successfully on the leasing system with about 40 men at work, and it has, during the past three years, paid over $50,000 in dividends under such conditions. Hardy & Co. shipped a carload from the 555-ft. level, which gave values of 15 oz. gold per ton, and McBurney & Co. shipped a lot from the 220-ft. level on the Vivian-Nottaway which returned values of 11 oz. gold per ton. Tom Martin is superintendent.

LAKE COUNTY—LEADVILLE.

Bessie Wilgus.—The shaft is now down a little over 400 ft. and is in the blue lime which generally overlies the ore. It is the general belief that the shaft will be in ore in a very

Coronado.—The south drift towards the Penrose has cut the water course and is now being diverted to the Coronado shaft; the extra flow amounts to a little over a 100 gal. per minute.

Dome Shaft.—This mine in Rock hill, belonging to the Iron Silver Mining Co., has opened a small body of ore in the bottom of the shaft, 250 ft. deep. This claim is northeast of the Reindeer, and recently a new plant of machinery was put in place to sink the shaft deeper. The ore that has been opened is similar in character to that found in the Reindeer, and will be followed. The Dome is one of the oldest properties in the district.
few days.

Elk.—A fair streak of ore was opened in the upper level a few weeks ago, and the ore from it netted 12 oz. gold per ton. A drift is now being run from the bottom level to catch the ore at a greater depth where it is believed it will widen out.

Harrison Reduction Works.—A company has been formed of Leadville and Philadelphia capital to work over the old dump at this property. A lease of several years has been secured and the slag will be re-smelted.

Little Sister.—The drill hole is now over 800 ft. and is in the lime. The formation so far is the same as found in the Mike claim one and a quarter miles further up the hill.

Onyx.—This mine on French mountain, above timberline, is still able to ship ore on account of the splendid weather, no snow yet being on the range. The ore holds up to five ounces gold per ton. During the winter months the tunnel will be driven on this property to cut the Ideal vein that is several hundred feet ahead.

Saguache Placer Mining Co.—This company during the season just closed has done a great deal of prospecting work in the ground on lower California gulch, and the results have been so satisfactory that in the spring dredgers will be put in and the ground systematically worked. The average returns were 25 cents per foot.

Sunday.—This claim is shipping 25 tons daily of high-grade ore and about the same quantity of second-class ore, which runs better than $30 per ton.

Yak Tunnel Mill.—The framework on the structure is nearly completed and in a few days the roof will be put on. The machinery is arriving daily and being installed.

TELLER COUNTY—CRIPPLE CREEK.

Alpha & Omega.—A lease has been obtained on these two claims on the southwest spur of Gold Hill by M. B. Burke and associates, and work has been commenced. Operations are at present being conducted through the Caledonia shaft, which is about 200 ft. deep. Mr. Burke recently operated the Henry Adney claim on Beacon Hill, which was sold to Colorado Springs people.

Findley Gold Mining Co.—The difference between the stockholders in this company with regard to the consolidation of the property with that of the Valley City Co. owning the Shurtloff No. 2 lode will be settled by arbitration. The arbitration committee will consist of three well-known mining engineers who are to be in no way connected with the properties, and are to be appointed by Judge Cunningham of the district court. The men to compose this committee are Messrs. E. E. Chase, Max Boehmer and E. Le Neve Foster, all well-known mining engineers of Denver.

Mary McKinney Gold Mining Co.—The suit of the Morning Glory Mining & Leasing Co. against this company has been begun and is now in progress in the United States court in Denver. A number of the most prominent engineers of the State are in attendance. The Morning Glory Mining & Leasing Co. owns the Aileen claim and also claims that a portion of the apex of the Mary McKinney vein is on this property. The suit is for the possession of this vein and damages to the amount of about $1,250,000. The case will probably occupy some time and the outcome is being watched with interest.

Ophir.—This property on Raven Hill is continuing to get good ore in its shaft. A new plant has recently been added to the equipment of the property and it is now in shape for production.

IDAHO.

BOISE COUNTY.

Friday.—This mine, at Kennedy, has been opened for 300 ft. Good ore is reported to have been exposed.

Lincoln.—A new triple-compartment permanent operating shaft has been started at this mine, at Kennedy, and will be sunk 500 ft.

Pearl.—The name of this town has been changed to "Kennedy."

South Lincoln.—A three-compartment shaft is being sunk at this mine, at Kennedy.

CANYON COUNTY.

Payette.—Machinery for this group, near Banner, is on the ground. A cross-cut tunnel has been driven to cut two ledges.

ELMORE COUNTY.

Basil.—Luther W. Spear has acquired this group of four claims, near Pine.

IDAHO COUNTY.

Dixie.—Considerable activity is reported at this camp. The Comstock has been taken by the men who have been working the L. & L., and the development work is said to be promising.

Empress Mining & Milling Co.—This company's property, near Roosevelt, includes 10 claims on Botha creek. A tunnel to cross-cut the formation has been driven 260 ft. Edward Schwerd is superintendent.

Imperial Gold Mining Co.—This company, which owns the Atlas group and the Consolation group, two miles from Elk City, is driving a tunnel on the former and sinking a shaft on the Consolation. The working force on both properties is being increased.

Twentieth Century.—On this property, at Roosevelt, two tunnels are being driven by contract.

INDIANA.

CLAY COUNTY.

While the situation in the block coal mines this fall has been the most unsatisfactory in the history of the district, the indications now are that the mines will be operated full time for the rest of the winter. The change in conditions came upon the announcement of a strike by the Illinois hoisting engineers. This district was at once flooded with orders, and enough have been booked to keep the mines busy for several months. While the strike was of few days' duration only, it served to awaken large consumers to the necessity of obtaining a supply. Every mine in the district that it is possible to work has resumed operations, several having been closed down for a time. The drouth is becoming quite a serious matter, as water is hard to obtain.

DELAWARE COUNTY.

Gas Belt Coal Co.—This company has incorporated, with principal office in Muncie. The company proposes to buy land and mine coal. H. H. Gilmore is president and J. M. Sadler, secretary.

GREENE COUNTY.

Since election there has been a large increase in the demand for coal. Orders for domestic use are coming in rapidly, and manufacturers are also sending in large orders for steam coal. Factories whose orders have been comparatively small recently are now ordering as they did during the last two years.

ST. JOSEPH COUNTY.

Valm-Stephens Mining Co.—This company has filed articles of incorporation, with capital stock, $10,000; directors, Chauncy Fassett, E. B. Doran and T. C. McInery. The company will engage in mining in Indiana and other States.

VIGO COUNTY.

In order to get a cheaper rate for accident insurance for miners, the Indiana coal operators, at a meeting held in this city, have decided to form a mutual insurance company. The object is to protect the operators against claims for personal injuries to miners.

NEVADA.

ESMERALDA COUNTY.

Goldfield.—The Combination company has declared a dividend of $40,000, being 10 per cent of the capital stock. This company has entered the list of regular dividend payers. The dividends will be paid quarterly and will be 10 per cent of the capital stock. The mine is earning more than this disbursement, which will give a substantial treasury reserve for further equipment.

A. Riggs and associates, leasing on the Patrick claim of the Goldfield Lone Star Co., have opened up a good body of shipping ore at a depth of 8 ft. The shoot is apparently the extension of the exceptionally rich Cimeron lead that was opened up a month ago. An average assay across several inches of the shoot gave returns of $300 per ton. As development progresses the shoot is widening out, and every indication points to the occurrence of a big body of shipping ore.

Bowes & Kernick have opened up a good body of shipping ore on the 110-ft. level of the Vernal No. 2, north of Diamondfield. The ore is reported to be of exceptional richness. The property is under lease.

In three days the values at the 110-ft. level of the Gold Wedge claim of the Jumbo Extension Mining Co. have increased from $1.60 to $37.40 per ton. The ledge is being opened up at this level by a cross-cut. The character of the ore indicates that it is an extension of the great Jumbo lead. The management is prosecuting development work on the theory that underneath the broken-up vein matter that is now being found an important shoot of ore will be disclosed. Development work on the Black Butte continues with very satisfactory results. At the 100-ft. level in the shaft a cross-cut has been driven to open up the extension of the Quartzite ledge. The wall has been cut and values have jumped from less than $10 to $50 across the face. The management expects to open up a shoot of shipping ore with a little more work. A great deal of milling ore is being exposed in the working tunnel of this property. Considerable dead work in the way of timbering has been done on the January preparatory to pushing the extraction of ore as rapidly as possible during the remainder of the lease. The production of shipping ore will be maintained at from 15 to 20 tons per day until the lease expires on January 5. The average value of this ore will be $200 per ton. A drift has been started at the 160-ft. level of the Combination to exploit the new ore shoot, opened at surface, 200 ft. south of the shaft. This mine is maintaining its regular production. Affairs in the Jumbo directorate appear to be no nearer settlement. The Zinn and Bowes-Kernick leases are the only ones operating, the Fuller lease having been stopped by injunction. This was done by the Taylor-McClelland faction. In turn the McKane faction succeeded in placing the property in the hands of a receiver. It looks as though a long-drawn-out legal battle is to be fought before a settlement is reached and the property operated on company account.

It is persistently rumored that an important strike has been made on the Sandstorm claim. Lessees on the Kendall, adjoining, report that they are mining high-grade shipping ore from their lease, but nothing can be learned definitely regarding the developments on the Sandstorm.

PENNSYLVANIA.

ANTHRACITE COAL.

Enterprise.—The fire at this mine, at Shamokin, which was reported extinguished, is said to have revived.

Philadelphia & Reading Coal & Iron Co.—The falling of a six-ton rock in this company's East Brookside colliery caused the death of three miners on November 10.

Lehigh Valley Coal Co.—The Mt. Carmel colliery of this company has been flooded by the breaking in of water from an old working in the Mammoth vein.

Scranton Coal Co.—It is announced that this company will soon begin sinking a new shaft at Throop.

BITUMINOUS COAL.

H. C. Frick Coke Co.—Orders have been given for the firing of this company's ovens, at Greensburg.

J. C. Martin Coal Co.—This company has awarded a contract for sinking four shafts on its property, at Portage.

TEXAS.

GONZALES COUNTY.

Harwood.—M. S. Blackburn, of this place, and Davis & Masterson, of Houston, have leases covering large deposits of hematite iron ore, and the Southern Pacific railway is surveying a switch to the property.

HARDIN COUNTY.

Batson.—This field is now producing about 8,000 bbl. daily, of which the Guffey Petroleum Co. produces one-half. Only a few wells are drilling. Crude brings 35c. to 38c.

Sour Lake.—Heath & Quigley have a new well in the Cannon tract doing 200 bbl. daily, and are drilling another. The Sour Lake Oil Co. has also let a contract for a new well. Crude brings 35c. to 40c. The daily production is 18,000 bbl.

HARRIS COUNTY.

Humble.—There are five rigs working here. The Bennett well is down 900 ft., the Danberry 940 ft., and the Higgins Oil Co. 560 ft., Sharp Bros. 500 ft., and D. B. Beattie well, 200 ft. Gas blow-outs are frequent, and the drillers are having much trouble in reaching the oil sand.

WASHINGTON.

FERRY COUNTY.

Lucille Dreyfus.—The lessees report having struck 8 ft. wide ore on the 100-ft. level, of better quality than any before found in the mine. Another good body of ore was recently found above the adit level. The mine is now putting out and shipping from two to three car-loads a week to the smelter.

Mountain Lion.—The manager reports shipments of 70 tons of ore daily to the Granby smelter, at Grand Forks, B. C.

Colorado.—This group is on Nine Mile creek, northeast of Keller and 18 miles west of the Columbia river. It was purchased a month ago from the locators by J. C. Davenport, of Spokane, Wash., for $5,000. Ore carrying from 50 to 72 per cent lead and from 60 to 220 oz. of silver to the ton is found 5 to 6 ft. in width, in a contact between limestone and porphyry. The mine is opened by a short tunnel and a shaft 25 ft. deep. A wagon road will be constructed from it to connect with Creston, a shipping point on the Washington Central railway, in Lincoln county, south of the Columbia river.

FOREIGN MINING NEWS.

AFRICA.

TRANSVAAL.

The Transvaal Chamber of Mines reports that the output from the mines in October was 325,625 oz. fine gold, showing a gain of 13,339 oz. over the month of September. Allowing for the extra day in October, this shows substantially the same production. For the 10 months ending October 31 the total output was 3,073,241 oz. fine gold, or $63,523,891. The total for the 10 months in 1903 was 2,397,875 oz., showing an increase of 675,346 oz. this year.

ASIA.

INDIA—MYSORE.

Kolar Goldfield.—The production of the mines in this field for October is reported at 51,238 oz. bullion, a decrease of 428 oz. from the September statement. For the 10 months ending October 31 the total was 512,534 oz. bullion, against 493,587 oz. in the corresponding period in 1903, an increase of 18,947 oz. The bullion reported this year was equal to 461,280 oz. fine gold, or $9,534,658 in value.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—Shipments for the week ending November 12 were as follows, in tons: Granby, 10,170; Brooklyn Stemwinder, 1,740; Mother Lode, 2,880; Sunset, 270; Emma, 1,063; Senator, 66; Athelstan-Jack Pot, 210; Oro Denoro, 33; total for week, 16,432 tons; total for year to date, 694,735 tons.

MINING STOCKS.

(Full quotations on pages 855 and 856.)

New York. Nov. 23.

Collectively the stock market is strong, and the presence of large speculators, who were active in the boom last year, presages higher prices. Amalgamated Copper has broken away temporarily from the bears, and made the high record for the past two years at $81.75 on November 18. Transactions in the stock were heavy, and the bidding for large blocks by a prominent manipulator has instilled hope in a certain coterie that Amalgamated will eventually go to par. We shall see. Anaconda was sympathetically strong, advancing to $30.22, which is the highest price this year, and is only a fraction less than twelve months ago. Tennessee is in particularly good form, and legitimate investment orders have sent the price to $40.50, the high-water mark. Greene Consolidated, influenced by reports that foreigners are becoming interested in the property, sold up to $28.75. United, Heinze's company, showed sales at $10@$10.25 for the common stock, and $60@$62 for the preferred, only in small quantity.

Homestake, of South Dakota, has risen to $72, at which price the annual dividend yield is a fraction over 8 per cent.

Horn Silver, of Utah, sold again at $1.60, while Alice, of Montana, went to 90c.

Quicksilver common was exchanged at $2.30 @$2.50, and the preferred at $6.

In the Cripple Creek gold stocks little was done. Elkton Consolidated moved at 65@66c., and Isabella at 20c.

The Comstocks are weak, as is usual when the crop of assessments have been heavy. Consolidated California & Virginia sold at $2.10, Ophir at $2.30@$2.35, and Mexican at $1.10@ $1.25.

Small sales of Federal Smelting are reported on 'change at $55 for the common, and $73.875 @$74 for the preferred.

The Lehigh Coal & Navigation Co. will issue $1,577,200 new stock at par $50, stockholders of record November 9 being privileged to subscribe to the amount of 10% of their holdings. Payments must be made not later than December 3, and certificates for the new stock will be issued on December 10. The money received will be used to liquidate the loan made for the purchase of the Nesquehoning Valley Railroad. The dividends for 1904 have been 7% on par, which is appreciably more than for some years past.

Another company to increase its capitalization recently is the Pittsburg Reduction Co., from $1,600,000 (of which $600,000 was 6% preferred) to $3,800,000. A stock dividend of 100%, payable November 3, on the $1,000,000 common shares was offered to all shareholders as an inducement to subscribe at par $100 for $1,000,000 of the new stock. The treasury stock now amounts to $200,000. Dividends for several years past have been at the annual rate of 12%, and shortly after incorporation, in 1889, was 10 per cent.

The initial common dividend of the National Carbon Co., at the rate of 1.5%, or $82,500, has just been declared, payable in January next. The preferred stock yields 7% per annum, and since incorporation, six years ago, has paid 42%, or $1,890,000. It is interesting to remark that the company's preferred dividend in the year ending January 31, 1904, absorbed 10.7% of the net earnings; in 1903, 13.2%; in 1902, 13.4%, and in 1901, 15.5%. Net earnings in the four years mentioned have increased 44.7%, or $227,702, an amount that is equivalent to nearly three years' preferred dividends. Sales of the common stock are being made at $42@ $44, and of the preferred at $109@$111.50.

Boston. Nov. 21.

(From Our Special Correspondent.)

Profit-taking in mining shares has been on an enormous scale in this market, yet prices show comparatively slight changes during the past week. Brokers report that their commitments do not increase, for the reason that their selling orders about offset the buying ones. Money shows a tightening tendency, and the banks do not care to take the cheaper lines of copper shares as collateral. United States Mining continues to sell, mystery on. On one day with transactions of 24,000 shares, the range was within ⅝ of a point. The price continues between $24 and $25, and the best information is that a large part of the trading is matched orders. Bingham and Boston Consolidated are being absorbed by New York people. The former rose $2.25 to $38.25, and 1% was bid last week to call 1,000 shares at $40 for 60 days. The company is earning about $50,000 net per month. Boston has varied from $7.87½ to $7.25, but transactions have been on a large scale and tips are quietly spread that it will sell materially higher. Shannon is again tipped to move up after selling to $7.50. It touched $9.06¼ to-day.

Tamarack is off $3 to $126. The management announces that it has taken over the old Cliff property, which comprises about 8,640 acres. This company in the past has paid $2,280,000 in dividends. The purchase is made, it is said, for the purpose of drilling for the Kearsarge lode. Again the management discourage holders from anticipating dividends for the current half-year. Osceola, which touched $98, reacted to $94.75, but rallied to $98 again. This company is expected to declare $3 next month, making $5 for the current year. Calumet reached an even $700, but has reacted $15. There are persistent rumors that the next dividend will be an increase from the previous $10 rates. Greene Consolidated took a sharp spurt on New York orders, touching $28.75. Quincy rose $6 to $125, but lost $5 of the advance. Here, again, is an opportunity for an increase in the dividend rate on the better price for copper.

Mohawk touched $57.50 during the week, closing at $55.87½, and Copper Range came within 50c. of its record price, by touching $74.50. It broke to $71.87½ to-day, however. Allouez broke $2 to $18 during the week, and Atlantic $2.37½ to $19.12½. Centennial is off to $30, Franklin to $13, Parrot to $31.75, and Trinity to $15.50. Mass touched $8 to-day on the announcement that the assessment money was coming in well. Utah spurted to $46.75, but slid off $1 from this on free offerings of the stock. Granby touched $5.87½ on tremendous transactions, and Wolverine rose to $109. The speculation in the cheap copper shares has petered out somewhat.

Boston will get a new flotation in the near future. The Kaukauna property in Houghton county, Mich., has been taken over by Mr. J. Watson, who will offer the stock in a 15c. copper market at $6 per share. There are 100,000 shares.

Colorado Springs. Nov. 18.

(From Our Special Correspondent.)

In the dealing in Cripple Creek shares on the local exchange the market has been quite active during the past week, although prices are practically identical with those of one week ago. C. C. Consolidated, Elkton, El Paso and Work were the favorite traders. The most important strike of the week which appears to be authentic is reported from the Vindicator, where a cave from the surface opened up to the lessees $100,000 worth of ore.

That there will eventually be constructed another drainage tunnel much deeper and larger than the present one, which has proved so successful, seems quite probable, plans having been practically completed. This tunnel as planned will take about two years to build and drain 800 ft. below the present one.

Elkton sold to-day for 67c.; El Paso for $1.13½; Isabella for 19¼c.; Portland for $1.72; Work for 8c.; Anaconda for 10½c., and Cripple Creek Consolidated for 11c., the latter having advanced 1¼c. during the week.

Salt Lake City. Nov. 18.

(From Our Special Correspondent.)

New York Bonanza furnished the sensation of the week on the floor of the Salt Lake exchange. On the strength of the recent strike and the belief that the main ore-shoot had at last been encountered, after years of expectancy, the stock advanced rapidly. A few weeks ago it was not wanted at any price; this week it sold up to 35c. Several small lots of Century were sold at a low figure. It is quite likely an assessment will be levied before the close of the present year. Daly-West is a little stronger than a week ago. The November dividend of $72,000 was paid during the week. Grand Central shareholders were remembered to the extent of $12,500; the Mammoth also distributed $20,000, as did also the Annie Laurie, of the Gold Mountain district. Tetro directors have posted another $3,000 dividend, which is payable on December 1.

San Francisco. Nov. 17.

(From Our Special Correspondent.)

Business in the Comstocks was fair, and especially in the North End stocks there was a small advance. The Ward Shaft Association made a cash payment of $20,000 to-day on the pumping contract just signed, being one-quarter of the total amount agreed upon. Some quotations noted are: Ophir, $2.15; Consolidated California & Virginia, $1.70; Mexican, $1.05; Hale & Norcross, 60c.; Sierra Nevada, 34c.; Chollar, 13c. per share.

On the San Francisco & Tonopah exchange business was active, and there were a number of sales. Montana Tonopah brought $1.82; Goldfield Nevada, 61c.; Tonopah Belmont, 68c.; Bullfrog, 51c.; Tonopah Midway, 36c.; Tonopah North Star, 18c. per share.

On the California exchange trading in oil shares was dull, and sales were light. The heaviest trading was in the low-priced shares. Twenty-eight brought $10.50; Caribou, $5.50; Monte Cristo, 77c.; Oil City, 58c. per share.

Monterey. Nov. 16.

(From Our Special Correspondent.)

Exchange on New York has fluctuated between 214.75 and 215.25, but most transactions were at 215, at which it closed on Saturday.

Mining stocks were very quiet. Of the El Oro stocks, Victoria brought $41, Dos Estrellas, $3,100; Reforma, $30; San Luis Potosi, Barreno, $86; La Pas, $235. Of Pachuca, San Francisco sold at $86; Santa Gertrudis, $77; Bartolome, $100, and Soledad, $1,400.

COAL TRADE REVIEW.

NEW YORK, Nov. 23.

ANTHRACITE.

The anthracite market shows no new features. It continues practically a weather market, and, as frosty weather persistently holds off, there is nothing to change the even and somewhat dull tenor which prevails. Although we are now nearing the end of November, the weather continues very moderate, and everybody is confidently predicting an open winter, and is consequently delaying the purchase of coal. This, of course, has its effect on the wholesale trade in the prepared sizes. In steam sizes business continues moderate, but is, if anything, a little better than it has been.

In Chicago and other western territory conditions are almost the same. Shipments of anthracite to Buffalo and to the western all-rail points have been delayed by shortage of cars, and this condition promises to last for a time. In the lake trade the last cargoes are now being rushed up by boats, trying to make one or two more trips before the insurance period expires; after that time only a few scattering cargoes can be expected, although there is no sign yet of ice making, even at the Sault.

Prices continue unchanged in prepared sizes. There is no special alteration in steam sizes, although they are, if anything, a little firmer.

BITUMINOUS.

Conditions are strong and improving in the Atlantic seaboard soft coal trade. Producers generally are talking as if they had all the orders they desire, at least for the present, while the car supply is inadequate. The consensus of opinion intimates higher prices.

In the far East there is a pretty good demand, and the movement suggests that consumers are now buying who early in the year, when prices and freights were lower, did not feel inclined to come into the market. Along the Sound trade shows an increase, and shipments to all shoal-water ports are what are known as last cargoes before ice makes.

An improvement is noted at New York harbor, although this is the slowest consuming

market on the roll. All-rail trade is extensive, and the demand is so urgent that producers are obliged to curtail their tidewater shipments.

The car supply is especially poor on the Virginia roads, greatly inconveniencing shippers. Fortunately, transportation facilities are excellent, which to an extent relieves the aggravating position of the car shortage. In the coastwise market, large vessels are in good supply, and rates from Philadelphia are: To Boston, Salem and Portland, 60c.; Portsmouth, 65c.; Lynn and Newburyport, 75c.; the Sound, 50c. New York harbor freights continue at 60c. around the Cape.

Birmingham. Nov. 21.

(From Our Special Correspondent.)

There has been no hesitation in the coal production in Alabama. The strike of the United Mine Workers of America, in Alabama, commenced in July, is still on, with no definite indications of the same being settled in the near future. The operators assert their intention of fighting for "open shop" to a finish, while the union leaders say they can continue to hold out for an indefinite period. The coke production and the coal output at mines belonging to the furnace companies is not satisfactory, though there are many non-union laborers at work.

Messrs. G. B. McCormack and Erskine Ramsey, who a few weeks ago purchased extensive coal lands in Walker county, are preparing to develop the property. The Southern railway has let a contract for the construction of about two miles of road from the main line to the coal property in question, the work to be completed in 90 days.

There is a scarcity of coal cars reported in the industrial section of the State. All commercial coal operators in Alabama have orders on hand which will keep them busy for several months. It is common report that the railroads selling coal from this State are unable to get all demands supplied. There is a steady shipment of coal on the Mexican railroad contract, via the Louisville & Nashville from this State through the port at Pensacola.

Chicago. Nov. 18.

(From Our Special Correspondent.)

Sales of both anthracite and bituminous coal have been somewhat light in the last week, a situation attributed chiefly to mild weather over Chicago territory. In the Northwest the anthracite market continues to improve slowly, but in the West and local territory the demand has no more than held its own, if, indeed, it has done that. "Cold weather!" is the cry of dealers in anthracite, and doubtless this will be necessary to bring out the normal demand. Small sizes of anthracite are in demand locally and a good deal of pea is being sold by retailers.

Business in western steam grades continues fair, with Illinois mines supplying again most of the trade temporarily diverted to Indiana mines by the hoisting engineers' strike. Lump from Indiana and Illinois mines brings $1.70 @$$2.50; run-of-mine $1.50@$1.90. Domestic sizes are selling fairly well, but dealers complain of the effect of mild weather, and sales are light compared with the record of a year ago.

Smokeless continues in good demand and holds up well to $3; quotations are $2.95@$3.15. Hocking's advanced price holds down sales somewhat, but it is still popular at $3.10 @$3.20. The market generally may be said to be better for eastern than for western bituminous, with every prospect of a continued firmness.

Cleveland. Nov. 21.

(From Our Special Correspondent.)

Interest continues to center in the coke trade, with prices getting stronger. The larger producers are more disposed to hold for higher prices, and while most of them are holding still for $2.75 for 72-hour foundry coke, some dealers want $2.60 at the oven and have been getting it when delivery has been wanted promptly. The price on furnace coke is also stiffening under the better demand, and the price now holds at $2.15 to $2.25 at the oven. The car supply being short is a factor in the situation.

The coal situation is also improved. A fair demand has been seen with a much firmer tone to prices. Buyers have been more numerous, and the tendency to contract is more pronounced. There is no question about supply, save as it has to do with the ability of the railroads to meet the demands made upon them by mines and consignee. Prices have advanced, more by demand of operators than by consent of buyers. Run-of-mine steam coal is selling at $1.20@$1.25 at the mine, and slack 40@45c. at the mine.

Pittsburg. Nov. 21.

(From Our Special Correspondent.)

Coal.—The lake shipping season is practically over, and prices are a trifle easier. Run-of-mine is quoted at $1.40@$1.50 a ton, delivered at Pittsburg, and $1.05@$1.15 a ton at the mine. All the mines in the Pittsburg district, except the river mines, are fairly active, the supply of railroad cars being very good. A number were closed during the last two days of last week on account of a shortage of cars. According to reports, the Pittsburg Coal Co. will have strong competition for the lake coal trade next season. The Youghiogheny & Ohio Coal Co., by the Wabash deal with the Pittsburg Coal Co., was deprived of seven large mines. It has just bought the big mine of the Budd Coal Co., and has entered into contracts with independent operators for a supply. It is understood that a large Cleveland concern and a number of independent companies in the Pittsburg district are forming a syndicate to compete for the lake trade. It is given out that these interests will have fully 3,000,000 tons of coal, which will be offered at upper lake markets next year. This season's shipments of Pittsburg coal will amount to from 4,000,000 to 5,000,000 tons.

Connellsville Coke.—The H. C. Frick Coke Co. to-day issued orders to start all its idle ovens in the Connellsville region. The company owns about 16,000 ovens and has been operating but 75 per cent of them. Besides, the company has entered into contracts with a number of independent coke concerns for their product for next year. All this coke will be consumed at plants of the United States Steel Corporation, as the company is not in the market, and will sell none of its coke. It is almost impossible to quote coke prices, as a sale was made of furnace coke within the past few days at $3 a ton. Contracts are said to have been made for first quarter at $2.10@$2.25 a ton for furnace, and $2.25@$2.50 for foundry. The production last week was 194,433 tons, and the shipments aggregated 9,319 cars, distributed as follows: To Pittsburg and river points, 3,488 cars; to points west of Pittsburg, 4,631 cars; to points east of Everson, 1,200 cars.

San Francisco. Nov. 17.

(From Our Special Correspondent.)

The market continues quiet, with supplies about as usual, and no change in prices. Fuel oil is in good demand.

For Pacific Coast coals, in large lots to dealers, quotations are: Wellington and New Wellington, $8; Richmond, $7.50; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; white ash, $5.25. For Rocky Mountain coals, also in large lots to dealers, prices named are $8.50 for Castle Gate, Clear Creek, Rock Springs and Sunnyside; Colorado anthracite brings $14. For Eastern coal, quotations are largely nominal, supplies being light. Pennsylvania anthracite is $14 and Cumberland $13. For English coal, quotations are ex-ship: Welsh anthracite, $13; cannel, $8.50; Wallsend and Brymbo, $7.50 per ton.

Foreign Coal Trade.

The exports of fuel from Great Britain for the 10 months ending October 31 were as follows, in long tons:

	1903.	1904.	Changes.
Coal	37,595,109	38,559,640 I.	964,531
Coke	567,736	611,782 I.	44,046
Briquettes	802,494	1,059,992 I.	257,498
Totals	38,965,339	40,231,414 I.	1,266,075

In addition to these exports there were 13,958,917 tons of coal sent abroad for the use of steamships engaged in foreign trade in 1903, and 14,394,308 tons in 1904, an increase of 435,391 tons. The exports to the United States, included above, were as follows:

	1903.	1904.	Changes.
To Atlantic ports	1,050,761	26,606 D.	1,024,155
To Pacific ports	66,094	74,272 I.	8,178
Total	1,116,855	100,878 D.	1,015,977

Exports to Atlantic coast ports last year were abnormally large, owing to the coal strike.

Messrs. Hull, Blyth & Co., of London and Cardiff, report, under date of November 12, that prices remain unchanged. Smalls are a shade easier. Quotations are: Best Welsh steam coal, $3.54; seconds, $3.36; thirds, $3.12; dry coals, $3.24; best Monmouthshire, $3.06; seconds, $3; best small steam coal, $2.04; seconds, $1.80; other sorts, $1.68.

The above prices for Cardiff coal are all f. o. b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f. o. b. Newport, both exclusive of wharfage, but inclusive of export duty, and are for cash in 30 days, less 2½% discount.

The freight market is very quiet. Mediterranean rates slightly better. Some rates quoted from Cardiff are: Marseilles, $1.45; Genoa, $1.38; Constantinople, $1.20; Las Palmas, $1.38; St. Vincent, $1.50; Rio, $2.04; Santos, $2.52; Buenos Aires, $1.68.

IRON TRADE REVIEW.

NEW YORK, Nov. 23.

The iron trade continues strong, although there are some reports of a temporary lull in buying. This is not strange, considering the active business of the past few weeks; nevertheless, the lull is rather in appearance than in reality. Purchasers continue to press for material for the first half of next year, but in some cases it looks very much as if they were doing this in advance of their real needs. Furnaces and mills have been inclined to hold back, with a view of checking a tendency to speculation, which might turn over to others the profits resulting from future advances. The business is not all speculative, however, and much of the buying is based upon solid requirements.

The holding back is chiefly manifested in pig iron. Orders for finished material are based more closely on actual requirements for work. Car builders are in the market for large quantities of material; bridge builders are coming in a little more slowly, while in the general working lines there seems to be steady improvement in orders, which will require large quantities of material.

The advances in price on different lines of finished material are referred to at length in the local reports which follow. The rail question is still unsettled, and railroads generally are holding back on this account. There seems to be little doubt, however, that a large tonnage will be needed next year, and the rail makers do not seem inclined to give way, after holding out for more than a year.

As the season approaches its close, ore is coming down from the Lake Superior country with a rush. It begins to look now as though a sufficient supply would be brought down to meet all demands from the furnaces.

British Iron Trade.—Exports of iron and steel, including machinery, from Great Britain for the 10 months ending October 31 are valued by the Board of Trade returns as follows:

	1903.	1904.	Changes.
Iron and Steel	£25,801,127	£23,162,065 D.	£2,639,062
Machinery	16,534,532	17,352,142 I.	817,620
New Ships	3,704,740	3,548,997 D.	155,743
Total	£46,040,389	£44,063,204 D.	£1,977,185

Exports of mining machinery, included above, were valued at £620,600 in 1903, and £715,842 in 1904, showing an increase of £95,242. Of this increase, only £6,764 was in shipments to South Africa, which were valued at £300,314 this year. Exports to Australia showed an increase of £30,634. The chief items

of the iron and steel exports were as follows, in long tons:

	1903.	1904.	Changes.
Pig iron	928,565	683,620	D. 244,945
Steel ingots, blooms, etc	127,072	101,975	D. 25,097
Bars, etc	180,959	144,689	D. 36,270
Rails	528,160	437,233	D. 90,927
Sheets	137,180	127 294	D. 9,886
Tin-plates	243,245	291,560	I. 48,315

The only item showing increase in this list was tin-plates.

Imports of iron and steel into Great Britain for the 10 months were valued at £7,022,005 in 1903, and £6,868,968 in 1904, showing a decrease of £153,037 this year. Leading items of these imports were as follows, in long tons:

	1903.	1904.	Changes.
Pig iron	111,789	113,494	I. 1,705
Wrought iron	147,517	84,936	D. 62,581
Steel billets, blooms, etc	180,285	456,360	I. 276075
All other kinds	603,619	413,019	D. 190,000

A notable item was the increase in steel billets and blooms, which include sheet bars, tin-plate bars and other half-finished material. The greater part of these imports was from Germany and Belgium.

Imports of iron ores for the 10 months were 5,375,922 tons in 1903, and 5,106,711 tons in 1904, a decrease of 269,211 tons. Of the iron ores imported last year, 4,202,232 tons were from Spain, and 3,856,250 tons in 1904, showing a decrease of 345,982 tons in the Spanish ore this year.

German Iron and Steel Trade.—Imports of iron and steel into Germany for the nine months ending September 30 are reported as follows, in metric tons:

	1903.	1904.	Changes.
Pig iron	101,128	133,116	I. 31,988
Other iron and steel	116,338	126,798	I. 10,460

Imports of iron ore were 3,904,531 tons in 1903, and 4,736,450 tons in 1904, an increase of 831,919 tons this year.

Exports of iron and steel from Germany for the nine months ending September 30 were as follows, in metric tons:

	1903.	1904.	Changes.
Pig iron	338,216	172,486	D. 165,730
Other iron and steel	2,332,855	1,910,123	D. 422,732

A large part of the decrease was due to the smaller shipments to the United States. Exports of iron ore were 2,492,628 tons in 1903, and 2,577,954 tons in 1904, an increase of 85,326 tons. These exports are chiefly of minette ores from Luxemburg to France and Belgium.

Imports of manganese ores were 181,865 tons in 1903, and 224,318 tons in 1904, an increase of 42,453 tons this year.

Birmingham. Nov. 21.

(*From Our Special Correspondent.*)

The Alabama pig iron market presents a strong position this week, with prices again advanced. The production has been improved a little, one furnace having been blown in during the past week, and preparations are being made for two or three other iron-makers to begin operations shortly. No. 2 foundry has sold at $13.50, delivery during the first quarter of the coming year. There is no willingness on the part of the furnacemen to take business on a delivery basis of the next four or six weeks. The stocks of iron in this district are beginning to show a reduction. Some healthy sales of iron were made in the Birmingham district during the past week, and there has been a lively line of inquiries received. The strike of the union miners, which has been on since July 1, is still having its effect, and iron production is going to be curtailed as long as it lasts. The statement of heavy consumption of iron right in the Birmingham territory is reiterated. The cast-iron pipe works in this section are requiring much iron, and some good sales of iron have been made to these concerns, notwithstanding the recent advance in the quotations. The question has been asked why the cast-iron pipe works did not lay in their supplies of raw material for them at the time that prices were down. Investigation shows that heavy stocks were on hand, to all appearances, but there was such a demand for pipe that the melt has been greater than was first expected. So it was that the pipe makers find themselves on an advancing market.

The following quotations are given: No. 1 foundry, $13.50@$14; No. 2 foundry, $13@$13.50; No. 3 foundry, $12@$12.50; No. 4 foundry, $11@$11.50; gray forge, $10.50@$11; No. 1 soft, $13.50@$14; No. 2 soft, $13@$13.50.

There is no change in conditions at the southern steel plants. Activity is the word, and the production is heavy, with a good demand for all the rail, ingots, rod, wire and other products turned out in this district.

Pig iron stocks on hand in the Birmingham district will hardly go to 55,000 tons now, against 120,000 four months ago. Prices in that time have advanced $4 per ton on pig iron.

The raw material supplies are being improved in the Birmingham district. The Tennessee Co. recently purchased the dolomite works of the Birmingham Mining & Contracting Co., at Katona, a small place a few miles north of the city, on the Birmingham Mineral railroad. The works will be enlarged and the company's dolomite supplies greatly improved.

Chicago. Nov. 21.

(*From Our Special Correspondent.*)

In the last week there has been continued heavy buying of pig iron, both northern and southern, and prices are about 50c. higher, on the average, than they were a week ago. Northern is eagerly taken at $16, and local furnaces are sold out to April 1. Southern brings $13@$13.50 Birmingham, or $16.65@$17.15 Chicago. Sales are now running freely into the second quarter of 1905, and there is little if any iron available for spot deliveries. The demand for these or short-time lots is, however, very small. Six months ago everybody was trying to get iron on as short time between order and delivery as possible; today, the seller is reluctant and the buyer is eager to contract ahead six to eight months. Considerable iron remains to be sold yet to supply the local trade for the first quarter.

Under the rapid advance in prices northern has sold better, comparatively, than southern, but agents for southern profess to be satisfied with the situation. The long-standing trouble with the railroads over transportation means is not so formidable as in former years at the beginning of winter, and there will be comparatively little complaint on this score. Sales, probably, have not reached their maximum, however, and if a boom ensues the transportation problem will be much more serious than it now seems.

There is a moderate demand for Lake Superior charcoal, which sells for $17@$17.50, and is scarce.

Cleveland. Nov. 21.

(*From Our Special Correspondent.*)

Iron Ore.—The rush to buy iron ore, which was reported a week ago, about satisfied the present demands of the market, and the situation is again calm. The limitations placed on the buying are, of course, understood to be the ability of the shippers to make delivery before the end of the season, and the amount of ore brought down unsold and remaining on the docks here for distribution to the furnaces having need of it. It is now assured that the latter quantity was greater than had been supposed, and the shippers find they will be able to furnish enough ore by heavy movement before the vessel insurance expires, to prevent any necessity of moving ore in boats running after that season has closed. The rates of carriage were advanced during the past week 5c. a ton, making the charge now 80c. from Duluth, 75c. from Marquette and 65c. from Escanaba.

New York. Nov. 23.

Pig Iron.—The market is well sustained and a further buying movement has developed, prices being a little higher all around. More demand for southern pig has been shown. Northern iron, New York delivery, may be quoted as follows: No. 1 foundry, $16.75@$17; No. 2X, $16.25@$16.50; No. 2 plain, $15.75@$16; gray forge, $14.50@$15. Virginia basic has sold up to $16.50. Southern iron on dock is quoted as follows: No. 1 foundry, $17@$17.50; No. 2, $16.75@$17.25; No. 3, $16@$16.50; No. 4, $15.50@$16; No. 1 soft, $17@$17.25; No. 2 soft, $16.75@$17; gray forge, $15@$15.50.

Dealing in warrants on the Produce Exchange has been rather active. The latest quotations are as follows, the first figure giving the bid, the second the asked price: November, $16.75—$17; December, $17.10—$17.40; January, February and March, $17.10—$17.50; April, May and June, $17.25—$17.50. The December price is a little over actual sales for New York delivery.

Bars.—The market is firm and a little higher. Quotations are 1.545, car-load lots, Jersey City delivery. Soft steel bars are the same as for iron. Store trade is better, and prices are steady, at 1.70@1.75, immediate delivery.

Plates.—Buying continues very fair, especially in small lots. We quote for tank plates, ¼ in., 1.545, in large lots, tidewater delivery. Flange and boiler plates are 1.645, same delivery.

Structural Material.—Business has been mainly in small lots. Quotations have been steady, at 1.55@1.65 for beams, angles and channels.

Steel Rails.—There is no change in quotations for standard sections, $28 per ton at mill still being the regular price. Very little business is doing here. Light rails are quite active, and prices continue at $21 per ton for 40-lb. rails at mill, and $24 for 16-lb. rails.

Scrap.—Old material is rather higher, and there is a considerable demand. Machinery cast brings $12.50@$13 per ton, local delivery. No. 1 railroad is scarce and prices variable. In heavy steel melting scrap sales have been made as high as $15, delivered, but about $15 is the general quotation, on cars, Jersey City.

Philadelphia. Nov. 22.

(*From Our Special Correspondent.*)

Our leading brokers and pig iron agents cannot be induced to express a positive opinion on the pig iron market to-day, nor even to speak freely concerning the business they have transacted during the past few days. From what can be gathered, it is quite evident that a speculative advance is likely to be made, although the pig iron people themselves say it will do more harm than good. They are blaming the buyers for being too anxious to cover contracts far ahead, and say that if prudence were exercised, all could obtain sufficient iron at moderate prices to see them through all the work that will come in. It is difficult to give exact quotations to-day, one reason being that some of our larger makers have sold all the iron they are anxious to sell, and have been quoting higher prices than iron is actually worth. Forge and foundry irons are not easily had, owing to some sort of an arrangement or understanding entered into by some of the larger buyers and makers, which stipulates that they shall be looked after first. No. 1X foundry is quoted to-day all the way from $16.75 to $17.25, and even more. No. 2X foundry is hard to get at $16.50, and even $17 has been asked. No. 2 plain would be picked up quickly at $16, and some has sold at that figure. Mill irons are wanted at $15, but $15.50 has been paid. Basic iron is the subject of a good deal of negotiation, and until something further transpires it will be impossible to say what the price will be.

Billets.—The possibility of an advance in wages in rolling mills is entering into the calculations of buyers. It is thought that billets will not long remain at $21, though just at present very little is being purchased.

Steel Rails.—The differences of opinion among rail makers and rail buyers is still apparent in the absence of any particular demand. A strong effort is still being made to have a reduction made to $26, instead of $24, as was demanded some time ago. The railroad companies refuse to make concession in freight rates, and so the matter stands at this moment so far as inquiry can develop the actual facts.

Scrap.—One or two western railroads have sold large quantities of scrap, and one or two of our eastern systems are holding their scrap for better prices. This creates a scarcity of railroad scrap, which it is almost impossible to get, even at $18@$18.50. Some No. 1 steel scrap has been gathered up at $15.50, but it is hard to get, even at that figure. Machinery scrap is quoted at $14.50, though it does not appear there is any on the market seeking buyers. Forge fire scrap is quoted all the way from $11 to $13 per ton.

Pittsburg. Nov. 21.

(*From Our Special Correspondent.*)

As indicated in the last report, advances have been officially ordered in several lines, and the iron and steel markets are unusually active. In billets, sheet and tin-plate bars the increase is $1.50 a ton, making the new prices as follows: Bessemer and open-hearth billets, $21, and sheet and tin-plate bars, $23 a ton, all f. o. b. Pittsburg. This action was taken by the billet pool. The beam pool met and re-affirmed prices of structural material, and the plate pool decided to defer action on prices until next month. A stiff advance in plates seems certain. The American Steel & Wire Co. announced an advance of $2 a ton on wire products, wire nails being increased 10c. a keg. The American Sheet & Tin-Plate Co. advanced the price of black sheets $2 a ton, and galvanized sheets, $3 a ton, and tin-plate prices were increased $3 a ton. This puts the price of 100-lb. coke bright plate from $3.30 to $3.45 a box to large buyers. The National Tube Co. has advanced the price of boiler tubes approximately $4 a ton. Merchant pipe has been very active since the two recent advances, and a third advance would not cause much surprise. Steel bar prices were not advanced by the pool, but action may be taken at any time. Some concerns are quoting $1 and $2 a ton above the pool price. The rail pool did not reach an agreement, but is expected to re-affirm the $28 rate for 1905 at a meeting to be held within the next two weeks. Some differences are said to exist between the members of the pool and the Lackawanna Steel Co., which has been out of the pool for two years, while its big new rail plant was being built. The trouble is understood to be over the allotment, but it is confidently believed by interests here that the matter will be amicably adjusted, and some heavy orders are expected to be placed as soon as prices are fixed. Independent manufacturers of wire products, tin-plate and sheets immediately followed the action of the subsidiary companies of the United States Steel Corporation in advancing prices.

The past week has been the most active of the year, more orders for finished products having been booked than in any one week since the opening. The American Steel & Wire Co. is refusing orders for delivery beyond January 1, and another advance in prices is expected, which may restore prices to what they were before the heavy reduction of a few weeks ago. Tin-plate is particularly active, and the leading interest is rapidly putting its idle mills in operation. The Star works, in this city, will resume to-morrow in full. Sixteen mills of the big Laughlin plant were started this morning, and the entire plant may be on before another week. The Crescent plant, at Cleveland, was started last week, after an idleness of two or three months; the South Sharon works, at Sharon, and the Shenango works, at New Castle, are scheduled to go on in a short time. Orders have been issued to start 20 mills at the American works at Elwood, Ind. The other eight mills have been in operation. According to official and semi-official reports, the American Sheet & Tin Plate Co. will start 68 idle tin-plate mills within the next two weeks. The company owns 249 tin-plate mills, and is now operating 131 mills. If present plans are carried out there will be but 50 idle mills in the opening week of December, and some of these may be started before the close of the year. The American Co. is also preparing to start a number of idle sheet mills, and orders were issued to get the Scottdale works ready for resumption this week. A general improvement in all lines is noticed, particularly in plates, and all the mills are busy. This is due to the large number of orders for railroad cars being filled by the three steel car-building companies, and for plates that will enter into the construction of the lake vessels to be built this winter. The conservative advances made indicate that producers are determined to guard against any action that might tend to check the active buying movement.

Pig Iron.—Sales of pig iron during the week have not been large, and there is but little iron available for delivery this year, and most of the furnaces are pretty well sold up for the first quarter of next year. A number of inquiries were received for very large tonnages for next year's delivery, but furnaces are not willing to sell ahead at prices now prevailing. One inquiry was for 8,000 tons of gray forge for shipment in the first six months of the year, but a satisfactory price could not be arranged. Foundry iron is very scarce, and prices are higher than bessemer. Southern iron cannot be had for this year, and the price for No. 2 grade for first quarter is firm at $13, Birmingham, and 50c. higher is quoted. Southern warrants were sold here during the week to the extent of 1,000 tons for first quarter delivery at $17.85. This is equivalent to $13.50, Birmingham, the freight being $4.35. Some small sales of foundry and bessemer were made within the past few days at about $15, Valley furnace, and this is the minimum price for first quarter, although some furnaces are asking $15.50 and $16. Gray forge is quoted at $14.50@$15, Pittsburg.

Steel.—The demand for finished steel is very heavy, particularly for plates. But few sales of billets of any consequence were made during the week. Steel bars continue firm, and quotations range from 1.30 to 1.40c. for bessemer, and 1.35 to 1.45c. for open-hearth. The plate market is very strong, prices ranging from 1.30 to 1.40c.

Sheets.—The demand is improving, and the outlook is regarded as very good. The leading producer has advanced the price of black sheets $2 and galvanized $3 a ton, making the minimum price for black sheets, No. 28 gauge, in large lots, 2.20c., and 3.25c. for galvanized.

Ferro-Manganese.—The market shows some improvement, and 80% domestic is quoted at $41.50@$42.50 per ton.

CHEMICALS AND MINERALS.

New York, Nov. 23.

Were it not for the renewal contracts for certain heavy chemicals to be delivered in future, the trade as a whole would appear dull. Domestic makers are taking 1905 orders for chlorate of potash at 8.125@8.25 per lb., f. o. b. works, and for chlorate of soda at 8.125c., prices that are much higher than a year or so ago when aggressive competition reduced profits to a minimum. Further alkali and caustic soda contracts over next year have been invoiced, and it looks as if future prices would continue to improve.

Quotations for wholesale quantities are as below, f. o. b. New York, unless otherwise specified:

Brimstone,	Domestic 2ds, long ton	$21.45
	Domestic 99.5%, long ton. (For Baltimore and Phila. add 25c.: Portland, 15c.)	21.75
	Foreign 2ds, long ton	21.50
	Foreign 3ds, long ton	20.875
Pyrite, Am. 42@44%, lump, unit, at shipping port		10@10½c.
Am. fines, unit, at shipping port		8½@9c.
Spanish, 46@52%, lump, unit		10@11½c.
Spanish, fines, unit		9@10c.
Nitrate of soda, 95%, 100 lb.	spot	2.32½
	shipments	2.30@2.32½
96%, 100 lb.	spot	2.35
	shipments	2.32½@2.35
Sulphate of ammonia, gas liquor, 100 lb.	spot	3.07½@3.10
	shipments	3.10@3.12
Bleaching powder, prime, 100 lb		1.20@1.25
Cyanide, lb		19@20c.
Copper sulphate, 100 lb		4.875@5.00
Nitric acid, 36°, 100 lb.		4.50
38°, 100 lb.		4.75
40°, 100 lb.		5.00
42°, 100 lb.		5.25
Oxalic acid, com'l, 100 lb.		5.00@5.375
Sulphuric acid, 50°, bulk, ton		13.50@14.50
60°, 100 lb. in carboys		1.05
60°, bulk, ton		18.00@20.00
66°, 100 lb. in carboys		1.20
66°, bulk, ton		21.00@23.00
Phosphate, Fla. rock, 77@80%, f.o.b. shipping port		7.25@ 7.50
Fla. rock, 77@80%, c.i.f. Europe		10.67@11.85
Fla. land pebble, 68@73%, f.o.b. shipping port		3.75@ 4.00
Fla. land pebble, 68@73%, c.i.f. Europe		7.70@ 8.40
Tenn. 78@80%, f.o.b. Mt. Pleasant		4.00@ 4.25
Tenn., c.i.f. Europe		10.27@10.67
Tenn., 78%, f.o.b.		3.75@ 4.00
Tenn., 75%, f.o.b.		3.25@ 3.50
So. Car., land rock, f.o.b. Ashley River		3.25@ 3.50
So. Car., river rock, f.o.b.		3.00@ 3.25
So. Car., river rock, c.i.f. Europe		6.33@ 6.56
Algerian, 63@70%, c.i.f.		7.04@ 7.71
Algerian, 58@63%, c.i.f.		6.15@ 6.60
Algerian, 53@58%, c.i.f.		5.05@ 5.20
Tunis, c.i.f.		6.15@ 6.60
Christmas isle, 80@85%, c.i.f.		13.20@14.03
Ocean isle, 88%, c.i.f.		13.60@14.45

Raw materials are particularly firm. In brimstone the interesting topic is the investigation by the Italian government of the Louisiana industry. At last there is an awakening of the possibilities for expansion in the domestic enterprise, and it is surprising that brokers who have long been active sellers of Sicilian brimstone now show a tendency to give up the eastern markets. Importers' quotations for best unmixed seconds are nominally $21.50, which, compared with the cost of shipment to Atlantic ports, leaves little profit to sellers here. A feature in the present competition is that the Louisiana producer sells direct to consumers, while the Sicilian combination is obliged to pay a commission to middlemen. Moreover, the domestic prime sulphur, analyzing somewhat higher than the best seconds from Sicily, sells at a premium of 25c. per ton at New York—a price, by the way, that is about $1.35 per ton lower than the cost of importing refined block sulphur in bulk. Another interesting fact is that the Union Sulphur Co. recently sent to New York and Philadelphia the largest single cargo ever received at these ports, amounting to about 7,500 tons. By handling such a large tonnage the cost in transportation is lowered materially, facilitating competition.

Nitrate of soda in most positions is worth $2.35 per 100 lb., a price that compares with a few years ago, when certain large brokerage firms in the "corner" experienced pecuniary losses. Reports from Chile state that the October production was the largest on record, amounting to 3,329,500 quintals, which compares with 2,940,036 qtl. a year ago. This heavy output is surprising, as it was thought that the 87 oficinas in operation (against 77 last year) had already attained their maximum, owing to the shortage in the labor supply. On the other hand, prices on the west coast maintain the high record, and it is intimated that the railways, which showed a benevolent spirit when the industry was in the dumps, now expect more for carrying nitrate. The steamship lines understand one another pretty well now, although a year ago they were suffering severely from competition.

A cable just received announces an advance in refined nitrate to 8s. 4d. per qtl. ($2), f. o. b. shipping port.

The statistical position of nitrate of soda for the nine months ending September 30 is officially reported as below, in quintals of 101.4 pounds:

	1903.	1904.	Changes.
Production	23,606,021	24,381,527 I.	775,506
Exports	21,144,265	20,060,834 D.	1,083,431
World's consumption	27,114,716	27,484,792 I.	370,076
Vis. supply, Sept. 30	18,776,054	17,981,919 D.	794,135

Notable changes this year are the increase of 3.3 per cent in production, and about half that quantity in the world's consumption. With regard to the visible supply, it is noteworthy to mention that Europe is credited with 8,326,630 qtl., or 46 per cent, and the United States with only 730,424 qtl., while stocks in Chile on September 30 were 8,924,865 qtl., equivalent to nearly three months' exports.

The foreign trade of Great Britain in the 10 months ending October 31 is shown below:

	Exports.	Imports.
Bleaching powder, lb.	73,262,448	22,366,912
Borax, lb.	.....	34,267,858
Brimstone, tons	.....	15,477
Chemical manures, tons	362,916	.....
Copper sulphate, tons	66,950	.....
Nitrate of soda, tons	.....	102,368
Phosphates, tons	.....	353,416
Salt, tons	530,604	.....
Saltpeter, lb.	.....	26,927,368
Soda ash, lb.	118,868,840	
Soda, bicarb., lb.	29,993,264	
Soda, caustic, lb.	124,072,576	
Soda crystals, lb.	20,146,560	28,479,584
Soda, sulphate, lb.	84,031,928	
Soda, other sorts, lb.	31,380,160	
Sulphuric acid, lb.	11,224,976	311,472

With few exceptions, export trade has depreciated to a point that suggests increased competition in future with Germany and the United States, notably in heavy chemicals.

Exports of phosphates from Savannah in October amounted to 24,395 tons, making 125,679 tons for the 10 months this year, principally to Germany.

Liverpool. Nov. 9.

(*Special Report of Joseph P. Brunner & Co.*)

Home trade deliveries are good, although export orders are not coming in as freely as could be desired.

Following are the exports of bleaching materials and sodas for the month of October as taken from the Board of Trade returns just issued: Bleaching materials to United States, 51,049 cwt.; other countries, 19,511; total, 70,560 cwt. Soda ash, 113,359 cwt.; bicarbonate soda, 33,875; caustic soda, 139,789; soda crystals, 25,392; salt cake, 93,351; other sorts, 32,140; total, 437,906 cwt.

Compared with the corresponding month of last year, exports of soda compounds show a slight increase, while bleaching materials are much less.

Soda ash is firm. For tierces the range is about as follows: Leblanc ash, 48%, £5@£5 10s.; 58%, £5 10s.@£6 per ton, net cash. Ammonia ash, 48%, £4 5s.@£4 10s.; 58%, £4 10s.@£4 15s. per ton, net cash. Bags, 5s. per ton under price for tierces. Soda crystals are in steady demand at generally £3 7s. 6d. per ton, less 5% for barrels, or 7s. less for bags, with special terms for a few favored markets. Caustic soda is more inquired for, and prices are firm, as follows: 60%, £8 15s.; 70%, £9 15s.; 74%, £10 5s.; 76%, £10 10s. per ton, net cash. Special quotations for the continent and a few other export quarters. Bleaching powder keeps very steady in spite of the limited export demand, and for hardwood £4 15s.@£5 per ton, net cash, is still the range as to market. Chlorate of potash has just been slightly advanced to 3 1-16d.@3 3-16d. per lb., net cash, as to quantity and market, in accordance with arrangement made between the English and foreign makers. Sulphate of ammonia is stronger at £12 10s.@£12 12s. 6d. per ton, less 2½% for good gray 24@25% in double bags, f. o. b. here. Nitrate of soda is dearer on spot at £11 for ordinary, up to £11 5s. per ton for refined in double bags, f. o. b. here, less 2½ per cent.

METAL MARKET.

New York, Nov. 23.

Gold and Silver Exports and Imports.

At all United States Ports in October and year.

Metal.	October.		Year.	
	1903.	1904.	1903.	1904.
Gold:				
Exports.	$352,177	$3,855,649	$41,889,028	$86,895,557
Imports.	5,026,036	8,005,223	36,666,708	76,699,893
Excess	I. $4,673,859	I. $4,149,574	E. $5,222,320	E. $10,195,664
Silver:				
Exports.	3,143,492	3,485,008	28,026,927	42,615,018
Imports.	2,738,158	1,561,163	19,339,427	21,238,394
Excess	E. $405,334	E. $1,923,845	E. $8,687,500	E. $21,376,624

These figures include exports and imports at all United States ports; they are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, New York.

For the week ending November 19 and for years from January 1st.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.	$7,461,306	$14,575	$253,924	$18,830
1904.	91,273,487	5,732,788	32,161,854	945,350
1903.	31,631,185	9,132,655	26,696,983	3,193,009
1902.	25,011,792	3,552,868	23,415,858	1,083,609

Of the gold exports this week $4,038,100 was in coin for the West Indies, and $3,393,206 in bullion for France; the silver went chiefly to London. Imports were mostly from Central America.

There seems to be some improvement in general business, and reports from all quarters are encouraging. Gold exports continue, a considerable additional amount having been taken this week for shipment to France and Germany. The exports to Cuba, on account of the recent loan, have ceased. There has been some talk of gold exports in connection with the portion of the Japanese loan taken here, but it does not seem probable that these will be large, as a considerable amount of the money subscribed here will probably be spent in this country for supplies.

The statement of the New York banks—including the 56 banks represented in the Clearing House—for the week ending November 19, gives the following totals, comparisons being made with the corresponding week of 1903:

	1903.	1904.
Loans and discounts	$887,234,300	$1,112,710,700
Deposits	847,333,400	1,159,877,600
Circulation	46,023,100	42,188,500
Specie	152,953,900	223,918,400
Legal tenders	62,790,800	75,640,700
Total reserve	$215,774,700	$299,559,100
Legal requirements	211,833,350	289,969,400
Balance surplus	$3,911,350	$9,589,700

Changes for the week this year were an increase of $695,150 in surplus reserve and decreases of $12,379,200 in loans and discounts, $16,167,400 in deposits, $125,400 in circulation, $2,640,300 in specie and $706,400 in legal tenders.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars, and comparison is made with the holdings at the corresponding date last year:

	1903.		1904.	
	Gold.	Silver.	Gold.	Silver.
N. Y. Ass'n.	$152,953,900	.....	$223,918,400	.....
England	160,233,360	.....	167,011,120	.....
France	479,333,295	$220,527,770	529,374,295	$220,065,410
Germany	165,785,000	58,250,000	178,060,000	62,560,000
Spain	72,540,000	94,030,000	74,280,000	98,725,000
Netherlands	20,423,000	31,463,500	27,615,000	30,044,500
Belgium	15,883,335	7,941,665	16,643,335	8,321,665
Italy	103,335,000	16,429,500	111,030,000	15,107,000
Russia	392,565,000	32,810,000	499,410,000	33,765,000
Austria	232,465,000	60,560,000	243,360,000	59,870,000

The returns of the Associated Banks of New York are of date November 19, and the others November 17, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

Silver has advanced, owing to the demand for November delivery. Certain accounts appear to have been short of the metal, and the effort to cover them has stiffened the price. Inquiry, however, at the advance has not been general.

The United States Assay Office in New York reports receipts of 91,000 oz. of silver for the week.

Shipments of silver from London to the East for the year up to November 10 are reported by Messrs. Pixley & Abell's circular as follows:

	1903	1904.	Changes.
India	£5,670,330	£8,564,568 I.	£2,894,238
China	310,060	372,722 I.	62,662
Straits	721,879	58,103 D.	663,776
Totals	£6,702,269	£8,995,393 I.	£2,293,124

Receipts for the week this year were £107,000 in bar silver from New York, and £10,000 from Australia; total, £117,000. Shipments were £125,000 in bar silver to Bombay, and £96,800 to Calcutta; total, £221,800; also £33,600 in Mexican dollars to Calcutta.

Indian exchange has been very active in consequence of large exports from that country. The Council bills offered in London were all taken at an average of 16.09d. per rupee, and the demand for bills was largely in excess of the amount offered. Shipments of silver to India are increasing.

The movement of gold and silver in Great Britain for the 10 months ending October 31 was as follows:

Gold.	1903.	1904.	Changes.
Imports	£23,699,678	£27,958,889 I.	£4,259,211
Exports	20,080,221	24,719,722 I.	4,639,501
Excess, imports	£3,619,457	£3239,167 D.	£ 380,290
Silver:			
Imports	£7,911,904	£9,921,230 I.	£2,009,326
Exports	8,608,267	11,057,901 I.	2,449,634
Excess, exports	£696,363	£1,136,671 I.	£440,308

Of the imports this year, £7,375,416, or 74.3% of the whole amount, was credited to the United States.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	$0.47	$0.48½
Peruvian soles and Chilean pesos	.42½	.45
Victoria sovereigns	4.85	4.87
Twenty francs	3.87	3.90
Spanish 25 pesetas	4.78	4.82

OTHER METALS.

Daily Prices of Metals in New York.

November	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. Cathodes, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
17	14¾ @14½	14½ @14½	14 @14¼	66	29½	4.20	5.55	5.40
18	" 14½	" 14½	" 14¼	66½	29½	4.20	5.60	5.45
19	" 15	" 14½	" 14½	....	29½	4.20	5.60	5.45
21	" 15	" 14½	" 14½	66½	29½	4.20	5.60	5.45
22	" 15	" 14½	" 14½	66	29½ @29½	4.20	5.62½	5.47½
23	.....	.....	.....	.....	.....	.....	.....	.....

London quotations are per long ton (2,240 lb.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wire-bars.

Our report closes on Tuesday, instead of Wednesday as usual, on account of the holiday this week.

SILVER AND STERLING EXCHNAGE.

November.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	November.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
17	4.8670	58½	26⅞	21	4.8687½	58¾	27⅛
18	4.8675	58½	26⅞	22	4.8710	59	27¼
19	4.8675	58½	26⅞	23	.....	.....	.....

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver .925 fine.

Copper.—During the week under review the market has again experienced a sharp advance. In view of the higher values established, consumers are inclined to proceed cautiously with purchases; producers, however, are seemingly not disposed to press any metal on the market, being all well sold up. Consumption continues very satisfactory, and with the prospect of larger requirements for traction and shipbuilding purposes, an active business is looked for for some time to come. The closing quotations are given as 14⅞@15c. for Lake copper; 14⅝@14¾c. for electrolytic in ingots, cakes and wire-bars; 14⅜@14½c. for cathodes; 14¼ @14⅜c. for casting copper.

The foreign market for standard copper, which closed last week at £66 12s. 6d., opened on Monday at £66 15s. On Tuesday, however, there was a large realization of speculative holdings, and the closing quotations on that day are cabled at £66@£66 2s. 6d. for spot, £66 10s.@£66 12s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £69@£69 10s.; best selected, £70 @£70 10s.; strong sheets, £78 10s.@£79; India sheets, £75 10s.@£76; yellow metal, 6⅛@6½d.

Exports of copper from New York for the week ending November 21 were 1,381 tons, principally to Italy, France and Russia. Imports for the week of November 18 were 113 tons.

Imports and exports of copper in Great Britain for the 10 months ending October 31 were as follows, in long tons; the totals giving the approximate quantity of fine copper contained in all material:

	1903.	1904.	Changes.
Copper ore	70,019	69,816 D.	203
Matte and precipitate	61,749	55,227 D.	6,522
Fine copper	52,676	76,230 I.	23,554
Total imports, fine copper	90,553	110,826 I.	20,273
Exports	44,382	41,992 D.	2,390
Balance, imports	46,171	68,834 I.	22,663

Of the imports this year, 188 tons of ore, 4,091 tons of matte and 40,443 tons of fine copper are credited to the United States, against 438 tons of ore, 4,110 tons of matte and 17,438 tons of fine copper last year.

Imports and exports of copper in Germany for the nine months ending September 30 were as follows, in metric tons:

	1903.	1904.	Changes.
Imports	59,561	79,304 I.	19,743
Exports	3,596	3,130 D.	466
Net imports	55,965	76,174 I.	20,209

The increase in imports this year was 33.2%. Imports of copper ore were 10,728 tons in 1903 and 6,543 tons in 1904, a decrease of 4,185 tons. Exports of copper ore were 11,730 tons in 1903 and 11,943 tons in 1904, an increase of 213 tons this year.

Tin has been quite active throughout the week, and there has been a good consumptive demand for early delivery. Futures remain neglected. The closing quotations are given as 29⅛@29¼c. for spot, 28⅞@29c. for futures.

The foreign market, which closed last week at £132 17s. 6d., opened on Monday at £133, and the closing quotations on Tuesday are given as £132 10s.@£132 12s. 6d. for spot, £132 @£132 2s. 6d. for three months.

Imports of tin into Great Britain for the 10 months ending October 31, with re-exports of foreign tin, are reported as follows, in long tons:

	1903.	1904.	Changes.
Straits	23,374	25,755 I.	2,381
Australia	3,897	3,476 D.	426
Other countries	2,546	2,095 D.	451
Total imports	29,817	31,326 I.	1,509
Re-exports	21,020	22,893 I.	1,873
Net imports	8,797	8,433 D.	364

The re-exports are largely Straits tin in transit to the United States. A considerable part of the tin from other countries is Bolivian metal.

Imports and exports of tin in Germany for the nine months ending September 30 were as follows, in metric tons:

	1903.	1904.	Changes.
Imports	9,895	10,842 I.	947
Exports	1,949	2,284 I.	335
Net imports	7,946	8,558 I.	612

Exports are chiefly of foreign metal, or of tin smelted and refined from foreign material.

Lead has ruled rather dull throughout the week, and nothing of interest has transpired. The closing quotations are 4.20c. New York, 4.12½c. St. Louis.

The foreign market is firm, Spanish lead being quoted at £13, English lead £13 2s. 6d.

Imports and exports of lead in Great Britain for the 10 months ending October 31 are reported as follows, in long tons:

	1903.	1904.	Changes.
United States	32,293	31,133 D.	1,160
Spain	90,841	91,867 I.	1,026
Australia	49,076	59,960 I.	10,884
Germany	11,002	14,063 I.	3,061
Other countries	6,563	6,955 I.	392
Total imports	189,775	203,978 I.	14,203
Exports	29,993	29,200 I.	793
Balance, imports	159,782	174,778 I.	14,996

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

Imports and exports of lead in Germany for the nine months ending September 30 were as follows, in metric tons:

	1903.	1904.	Changes.
Imports	38,121	45,989 I.	7,868
Exports	22,180	17,709 D.	4,471
Net imports	15,941	28,280 I.	12,339

Imports of lead ore were 58,134 tons in 1903 and 60,717 tons in 1904, an increase of 2,583 tons. Exports of ore were 984 tons in 1903 and 1,082 tons in 1904, an increase of 98 tons last year.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of November 5, that the price of silver has been 14.75 reales per oz. Exchange is 34.37 pesetas to £1. Local quotation for pig lead has been 62.25 reales per quintal, which, on current exchange, is equal to £11 5s. 6d. per long ton, f. o. b. Cartagena. Exports for the week were 2,437,832 kg. argentiferous and 64,950 kg. desilverized lead to Marseilles. There were also 10 tons of lead ore shipped to Liverpool.

Spelter continues very strong and advancing. There is a good demand on the part of consumers for both galvanizing and brass purposes, while producers are rather reluctant sellers owing to the high prices asked for ore. The closing quotations are 5.47½c. St. Louis, 5.62½c. New York.

The foreign market is strong, good ordinaries being quoted at £25 5s., specials £25 10s.

Imports and exports of spelter in Great Britain for the 10 months ending October 31 are reported as follows, in long tons:

	1903.	1904.	Changes.
Spelter	70,540	72,593 I.	2,053
Zinc sheets, etc	18,696	18,784 I.	88
Total imports	89,236	91,377 I.	2,141
Exports	6,373	6,626 I.	253
Balance, imports	82,863	84,751 I.	1,888

The imports and exports of zinc ore are not reported separately.

Imports and exports of spelter in Germany for the nine months ending September 30 were as follows, in metric tons:

	1903.	1904.	Changes.
Exports	44,253	45,984 I.	1,731
Imports	17,311	16,624 D.	687
Net exports	26,942	29,360 I.	2,418

Imports of zinc ore were 48,698 tons in 1903 and 68,712 tons in 1904, an increase of 20,014 tons. Exports of ore were 30,819 tons in 1903 and 28,867 tons in 1904, a decrease of 1,952 tons this year.

Silesian Spelter Market.—Herr Paul Speier writes from Breslau, under date of October 29, that the tendency of the market continues strong, while a speculative element is perceptible. Quotations are 22.90 marks per 50 kg., f. o. b. cars Breslau, which is equal to 4.94c. per lb. Zinc dust is rather slow to advance. It is quoted at 42.50 marks per 100 kg., f. o. b. Stettin. Imports into Germany for the nine months ending September 30 included 16,624 metric tons spelter, 108 tons zinc sheets, 1,542 tons scrap and 4,158 tons zinc-white. Exports were 45,984 tons spelter, 12,382 tons zinc sheets, 3,137 tons scrap and 13,691 tons zinc-white. Exports of zinc ore were 28,867 tons, and imports 68,712 tons.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of November 5, that prices paid continue high, and demand is strong. Quotations are a little unsettled. Some of the larger mines are asking for tenders for their production next year on a spelter basis. Although prices this year have been remunerative, the sellers want somewhat better terms for their ore, if possible. Shipments for the week were 1,349 tons blende to Burdeos and 321 tons to Swansea.

Antimony has scored another advance. The demand, however, is nothing out of the ordinary. The closing quotations are given as 8@ 8½c. for Cookson's; 7¾@8c. for Hallett's; 7⅝@7⅞c. for Hungarian, Italian, United States, French, Japanese and Chinese.

Nickel.—The price is quoted by leading producers at 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots, according to quantity, runs as high as 60c. per pound.

Imports of nickel into Germany, for the nine months ending September 30, were 1,039 metric tons in 1903, and 1,143 tons in 1904; an increase of 104 tons. Exports were 506 tons in 1903 and 810 tons in 1904, an increase of 304 tons this year.

Platinum.—Quotations are higher, at $19.50 per ounce.

Platinum in manufactured forms is higher. Messrs. Eimer & Amend, of New York, quote for different forms, as follows: Heavy sheet and rod, 72c. per gram; foil and wire, 74c.; crucibles and dishes, 78c.; perforated ware, 85c., and cones, $1 per gram.

Quicksilver.—Prices are low. In New York large lots have been offered at $40 per flask (75 lb.), with $41@$42 quoted for smaller orders. The San Francisco price is now $41.50 @$42. London price is £7 15s., with the same quotations from second-hands.

Imports of quicksilver into Great Britain, with re-exports of foreign metal, are reported as follows for the 10 months ending October 31, in pounds:

	1903.	1904.	Changes.
Imports	2,582,628	2,475,206 D.	107,422
Re-exports	1,226,302	1,673,648 I.	447,346
Net imports	1,356,326	801,558 D.	554,768

This shows a decrease of 40.9% in the quicksilver used or retained in Great Britain.

Imports of quicksilver into Germany for the nine months ending September 30 were 501 metric tons in 1903 and 514 tons in 1904, an increase of 13 tons. Exports were 51 tons in 1903 and 36 tons in 1904, a decrease of 15 tons this year. The figures indicate an increase of 28 tons in consumption.

Minor Metals and Alloys.—Thallium is quoted at 60@65 marks per kg. at Breslau, Germany. Manganese metal is quoted at 360 marks per 100 kg., f. o. b. Bremen, Germany. Manganese tin alloy, 55%, is quoted 365 marks per 100 kg. for first quality and 225 marks for second quality, both f. o. b. Bremen.

For other minor metals and their alloys, wholesale prices, f. o. b. works, are as follows:

	Per lb.		Per lb.
Aluminum, No. 1. 99% ingots	33@37c	Ferro-Chrom. (74%)	12½c.
No. 2. 99% ingots	31@34c	Ferro-Tungsten (37%)	45c.
Rolled Sheets	4c. up	Magnesium, pure (N. Y.)	$1.60
Alum-bronze	20@23c.	Manganese, (98@99% N. Y.)	75c
Nickel-alum	33@39c.	Chr'm'm, pure (N.Y.)	80c.
Bismuth	$2.10	Copper, red oxide	50c.
Fe.-Molybd'm (50%)	$1.00	Ferro-Titanium (20@25% N. Y.)	$2.75
Phosphorus, foreign	75c.	Ferro-Vanadium, (25% N. Y.)	$3.00
Phosphurus, American	70c.	Sodium metal	50c.
Tungsten (best)	$1.25		

Differences in price depend chiefly upon size and conditions of order.

Missouri Ore Market. Nov. 19.

(From Our Special Correspondent.)

There was no change in the highest price paid for zinc, and the assay basis still varies from $42 to $48 per ton of 60 per cent zinc, though some ore sold on straight bids was equivalent to a $50 basis. The capacity of the smelters drawing ore from the Joplin district is greater than the mines are outputting, a fact that was pointed out in this column last July, when both ore and spelter was considerably lower than now, and it was plainly indicated that the metal would have to advance, owing to this very condition. Smelters have been paying closer to the value of the metal contents of the ore this summer than ever before—sometimes exceeding the value of the metal contents, figuring the existing spot metal market—and spelter has advanced lately along with the ore, yet the ore is higher relatively than a fair margin of profit would warrant. The seven-to-one schedule of values, pronounced too high by the smelters two years ago, has been exceeded for four months. Prices have gone even higher, and are now more than an eight-to-one schedule of values.

Spirit was shown in the lead market during the week, the price being advanced to $55.50 per ton on at least one bin, a gain of $1.50 per ton, while the general advance in prices was $1 per ton, selling all week at $55 per ton.

Following are the shipments of zinc and lead from the various camps of the Joplin district for the week:

	Zinc lb.	Lead lb.	Value.
Joplin	3,419,070	352,540	$88,240
Webb City-Carterville	2,676,810	443,310	48,970
Galena-Empire	776,530	127,120	20,580
Duenweg	448,840	217,720	16,250
Alba-Neck	673,270	.....	16,160
Aurora	672,000	9,190	11,160
Badger	336,780	8,010	8,640
Zincite	369,650	7,730	8,340
Carthage	329,780	.....	7,750
Oronogo	332,380	1,050	7,470
Granby	386,000	57,000	6,780
Prosperity	126,060	111,000	6,060
Beef Branch	106,190	28,680	2,310
Spurgeon-Spring City	91,080	8,290	1,570
Reeds	57,970	.....	1,330
Baxter Springs	59,860	1 200	680
Totals	9,862,270	1,372,840	$252,290
Zinc value, the week,	$214,790;	47 weeks,	$8,153,920
Lead value, the week,	37,500;	47 weeks,	1,612,940

Average Prices of Metals per lb., New York.

Mo.	Tin.		Lead.		Spelter.	
	1903.	1904.	1903.	1904.	1903.	1904.
Jan ...	28.33	28.845	4.075	4.347	4.865	4.863
Feb ...	29.43	28.087	4.075	4.375	5.043	4.916
Mar. ..	30.15	28.317	4.442	4.475	5.349	5.057
April ..	29.81	28.132	4.567	4.475	5.550	5.219
May ...	29.51	27.718	4.325	4.423	5.639	5.031
June ..	28.34	26.325	4.210	4.196	5.697	4.760
July ...	27.68	26.573	4.075	4.192	5.662	4.873
Aug. ..	28.29	27.012	4.075	4.111	5.725	4.866
Sept ..	26.77	27.780	4.243	4.200	5.686	5.046
Oct ...	25.92	28.596	4.375	4.200	5.510	5.181
Nov. ..	25.42	.....	4.218	.....	5.038	.....
Dec ...	27.41	.....	4.162	.....	4.731	.....
Year...	28.09	.....	4.237	.....	5.400	.....

NOTE.—The average price of spelter in St. Louis for the month of January, 1904, was 4.673c. per lb.; February, 4.717c.; March, 4.841c.; April, 5.038c.; May, 4.853c.; June, 4.596c.; July, 4.723c.; August, 4.716c; September, 4.896c; October, 5.033c.

Average Prices of Copper.

Mo.	New York.				London.	
	Electrolytic.		Lake.		Standard.	
	1903.	1904.	1903.	1904.	1903.	1904.
Jan ..	12.159	12.410	12.361	12.553	53.52	57.500
Feb. .	12.778	12.063	12.901	12.245	57.34	56.500
Mar. .	14.416	12.299	14.572	12.551	63.85	57.321
April .	14.454	12.923	14.642	13.120	61.72	58.247
May .	14.435	12.758	14.618	13.000	61.73	57.321
June .	13.942	12.269	14.212	12.399	57.30	56.398
July ..	13.094	12.380	13.341	12.505	56.64	57.256
Aug. .	12.962	12.343	13.159	12.468	58.44	56.952
Sept .	13.205	12.495	13.345	12.620	56.82	57.645
Oct ..	12.801	12.993	12.954	13.118	55.60	60.012
Nov. .	12,617	.....	12.813	.....	56.30	.....
Dec ..	11,952	.....	12,084	.....	56.36	.....
Year..	13.235	.....	13.417	.....	57.97	.....

New York prices are in cents, per pound; London prices in pounds sterling, per long ton of 2,240 lbs., standard copper. The prices for electrolytic copper are for cakes, ingots or wire bars; prices of cathodes are usually 0.25 cent lower.

Average Prices of Silver, per ounce Troy.

Mo.	1902.		1903.		1904.	
	London, Pence.	N. Y., Cents.	London, Pence.	N. Y., Cents.	London, Pence.	N. Y., Cents.
Jan ...	25.62	55.56	21.98	47.57	26.423	57.055
Feb ...	25.41	55.09	22.11	47.89	26.665	57.592
Mar...	25.00	54.23	22.49	48.72	26.164	56.741
April. .	24.34	52.72	23.38	50.56	24.974	54.202
May...	23.71	51.31	24.89	54.11	25.578	55.439
June ..	24.17	52.36	24.29	52.86	25.644	55.573
July...	24.38	52.88	24.86	53.92	26.760	58.095
Aug...	24.23	52.52	25.63	55.36	26.591	57.806
Sept ..	23.88	51.52	26.75	58.00	26.349	57.120
Oct ...	23.40	50.57	27.89	60.36	26.760	57.923
Nov. ...	22.70	49.07	27.01	58.11	.....	.....
Dec ...	22.21	48.03	25.73	55.375	.....	.....
Year...	24.09	52.16	24.75	53.57	.....	.....

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

DIVIDENDS.

Company.	Payable.	Rate.	Amount.
†Amalgamated C. ...	Nov. 28	$0.50	$769,420
*Annie Laurie, Utah .	Nov. 25	.50	12,500
*Bart'lome de Medina	Nov. 30	.70	1,395
†Calumet & Ariz. .. .	Dec. 15	1.50	300,000
Calumet & Ariz, extra	Dec. 15	.50	100,000
†Calumet & Hecla ...	Dec. 20	10.00	1,000,000
*Central Lead	Nov. 28	.50	5,000
†General Chem., pf. ..	Jan. 3	1.50	150,000
*Homestake, S. D	Nov. 25	.25	54,600
Lehigh C. & Nav.	Nov. 28	1.75	502,133
‡Mexican Coal & C ..	Dec. 1	3.00	150,000
†National Lead, pf ..	Dec. 15	1.75	260,820
Parrot, Mont	Dec. 12	.50	114,925
*San Rafael aviador .	Nov. 21	37.20	26,784
*San Rafael, aviada .	Nov. 21	9.30	11 160
*Soledad, Mex	Nov. 21	13.95	13,392
*Sorpressa, Mex	Nov. 21	2.33	2,232
†Standard Oil.....	Dec. 15	7.00	6,790,000
†U. S. Steel Corp., pf.	Nov. 30	1.75	6,304,919

*Monthly. †Quarterly. ‡Semi-annual.

ASSESSMENTS.

Company.	Delinq.	Sale.	Amt.
Alta, Nev.	Nov. 12	Nov. 30	.05
Best & Belcher ...	Nov. 4	Nov. 25	.10
Bonanza, Utah ...	Nov. 21	Dec. 8	.04
Bullion, Nev	Nov. 11	Dec. 1	.05
Caledonia, Nev ...	Nov. 21	Dec. 12	.10
Chollar, Nev.	Dec. 15	.....	.10
Con. Imperial, Nev.	Dec. 6	Jan. 4	.01
Crown Point, Nev.	Nov. 9	Dec. 1	.10
Exchequer, Nev ..	Nov. 28	Dec. 20	.05
Fremont Con., Cal.	Nov. 30	.....	.25
Gould & Curry	Nov. 25	Dec. 14	.10
G. & S., Utah	Nov. 11	Nov. 28	.00½
Hale & Norcross ..	Oct. 31	Nov. 30	.10
Julia Con., Nev. ..	Dec. 8	Dec. 29	.03
Justice, Nev	Dec. 5	Dec. 23	.05
Potósi, Nev.....	Nov. 22	Dec. 13	.10
Red Slide, Cal	Nov. 12	Nov. 30	.05
S. Nevada, Nev. ..	Nov. 17	Dec. 7	.10
Socrates Con., Cal.	Dec. 2	.....	.01
Susannah, Utah. .	Nov. 11	Nov. 28	.005
Union Con., Nev. .	Nov. 9	Nov 29	.10
Wabash, Utah. ...	Nov. 24	Dec. 15	.05

NEW YORK.

Company.	Par. val.	Nov. 16 H.	Nov. 16 L.	Nov. 17 H.	Nov. 17 L.	Nov. 18 H.	Nov. 18 L.	Nov. 19 H.	Nov. 19 L.	Nov. 21 H.	Nov. 21 L.	Nov. 22* H.	Nov. 22* L.	Sales.
Alice	25	.....	.....	.....	.....	.90	.....	.....	.....	.....	.....	.....	.....	100
Amalgamated, C..	100	78⅜	75⅛	81⅛	77¼	81⅛	79⅛	80⅛	79⅛	81½	79½	.....	.....	563,870
Anaconda	25	119½	118	120	116	120	119½	118½	.....	120⅛	119	.....	.....	10,850
Belcher.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.20	.....	.....	.....	300
Brunswick	1	.....	.....	.....	.....	.....	.....	.....	.....	.17	.....	.....	.....	200
Chollar.....	2½	.....	.....	.....	.....	.16	.....	.14	.....	.....	.....	.....	.....	600
Chrysolite	50	.....	.....	.04	.....	.....	.....	.....	.....	.....	.....	.....	.....	500
Confidence.....	3	.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	150
Con. Cal. & Va...	2½	1.75	.....	.....	.....	2.10	.....	2.15	.....	2.16	.....	.....	.....	1,200
Cripple Creek Con.	1	.....	.....	.10	.09	.10	.09	.10	.....	.12	.10	.....	.....	5.500
Elkton Con	1	.65	.....	.65	.....	.66	.....	.65	.....	.66	.65	.....	.....	1,700
Federal Mg. & Sm.	50	49	.....	55	50	55	54	55	53½	55	.....	.....	.....	7,050
Preferred.....	50	.....	.....	75	72	75	74	.....	.....	74	73½	.....	.....	1,020
Gold Dollar.....	1	.....	.....	.....	.....	.....	.....	.06	.....	.....	.....	.....	.....	2,000
Gold Sovereign..	2	.06	.....	.....	.....	.....	.....	.....	.....	.07	.....	.....	.....	1,000
Gould & Curry..	1	.....	.....	.13	.....	.....	.....	.....	.....	.....	.....	.....	.....	300
Greene Con.	10	25⅛	24⅛	25⅞	25	26⅛	25⅛	26	25⅜	28⅛	26½	.....	.....	49,950
Hale & Norcross..	3	.....	.....	.64	.....	.....	.....	.65	.64	.68	.....	.....	.....	1,100
Homestake.....	100	.....	.....	.....	.....	.....	.....	.....	.....	.72	.....	.....	.....	110
Horn Silver	20	.....	.....	1.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	700
Isabella.....	1	.....	.....	.20	.....	.20	.....	.....	.....	.....	.....	.....	.....	1,000
Julia.....	1	.06	.....	.....	.....	.05	.....	.....	.....	.....	.....	.....	.....	700
Justice	2	.....	.....	.....	.....	.06	.....	.....	.....	.....	.....	.....	.....	300
Little Chief.....	50	.....	.....	.....	.....	.66	.....	.....	.....	.....	.....	.....	.....	300
Mexican.....	3	.....	.....	1.10	.....	1.25	.....	.....	.....	.....	.....	.....	.....	400
Moon Anchor	5	.....	.....	.07	.....	.....	.....	.....	.....	.....	.....	.....	.....	500
Moulton	25	.....	.....	.....	.....	.15	.....	.....	.....	.14	.....	.....	.....	700
Ontario	100	.....	.....	.....	.....	.....	.....	4.25	.....	4.00	.....	.....	.....	275
Ophir.....	3	.....	.....	.....	.....	2.35	2.30	.....	.....	4.25	.....	.....	.....	500
Overman	2	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	500
Pharmacist.....	1	.03½	.....	.....	.....	.03½	.....	.....	.....	.....	.....	.....	.....	3,000
Phœnix.....	1	.16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	200
Potosi	1	.10	.....	.....	.....	.....	.....	.....	.....	.21	.20	.....	.....	500
Quicksilver	100	3½	.....	2½	2½	2½	2½	2	2½	2	3	2½	.....	5,664
Quicksilver pf....	100	6½	.....	6	.....	6½	6	.....	.....	7	6½	.....	.....	750
Rose Maud.....	1	.....	.....	.....	.....	.....	.....	.05	.....	.....	.....	.....	.....	1,000
Savage	3	.23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	100
Sierra Nevada ..	3	.25	.....	.34	.....	.42	.....	.....	.....	.....	.....	.....	.....	700
Silver Hill.....	1	.54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	200
Small Hopes.....	20	.28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tennessee C.....	25	.37	.36¾	.38	.36¾	.40½	.38¼	.41	.39	.40½	.38¼	.....	.....	18,805
Union Con.....	1	.50	.49	.50	.....	.55	.....	.....	.....	.....	.....	.....	.....	1,100
Union Copper....	10	1⅛	1⅛	1⅛	1⅛	2⅛	1⅛	2⅛	2	2⅛	2	.....	.....	13,100
United Copper ..	100	11	10	10½	10	10½	10½	10	9½	.....	.....	.....	.....	1,350
United Cop. pf....	100	63	.....	62	60	.....	.....	59	.....	.....	.....	.....	.....	500
White Knob.....	10	⅜	⅜	⅞	1/16	1⅛	1	1⅛	1⅛	1⅛	1⅛	.....	.....	19,020
Work.....	1	.07	.....	.....	.....	.05	.....	.08	.....	.09	.08	.....	.....	3,800
Yellow Jacket....	3	15	.....	.....	.....	.....	.....	.20	.....	.....	.....	.....	.....	700

Total sales, 723,864 shares. * For quotations see next issue.

SALT LAKE CITY.*

Nov. 18

Company	Par Val	High.	Low.	Sales.	Company.	Par Val	High.	Low.	Sales.
Ajax	$1	.11	.11	500	Lower Mammoth.	$1	.18	.18	1,500
Butler-Liberal ...	1	.12½	.11½	6,000	May Day.....	1	.34½	.33	34,500
Beck Tunnel Con	1	.10½	.06	5,000	N. Y. Bonanza....	1	.35	.12½	68,100
Carisa.....	1	.15	.15	1,500	Sacramento.....	5	.12	.10½	400
Con. Mercur.....	5	.44	.43	3,500	Silver Shield.....	1	.16	.12½	7,500
Columbus Con	1	1.20	1.20	500	Star Con.....	1	.15½	.15	1,000
Daly-Judge.....	1	4.40	4.10	500	Tetro.....	1	.23	.22½	2,500
Daly-West	20	13.50	12.75	175	Uncle Sam Con...	1	.23½	.23	2,000
Ingot.....	1	.01	.01	3,000	Victoria.....	1	1.90	1.90	200
Little Chief.....	1	.02½	.02½	2,000	Victor Con.	1	.06	.06	1,000

*By our Special Correspondent. Total sales, 141,375 shares.

BOSTON, MASS.

Company.	Par val.	Nov. 16 H.	Nov. 16 L.	Nov. 17 H.	Nov. 17 L.	Nov. 18 H.	Nov. 18 L.	Nov. 19 H.	Nov. 19 L.	Nov. 21 H.	Nov. 21 L.	Nov. 22* H.	Nov. 22* L.	Sales.
Adventure Con...	$25	7½	7	7	6½	7	6½	6½	6	6½	6	.....	.....	1,734
Allouez.....	25	20½	19¾	20	19¾	20	18	18½	18	19½	18¼	.....	.....	13,704
Amalgamated ...	100	78⅜	75⅜	81½	77¼	82	79¼	80½	79½	81½	79½	.....	.....	55,215
Am. Z. L. & Sm...	25	13½	13	13¾	13½	13½	....	13⅜	13	13⅜	13	.....	.....	1,115
Anaconda.....	25	29½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
Arcadian.....	25	3	2⅞	2⅞	2⅞	3	2⅞	2½	....	2⅞	2⅜	.....	.....	2,891
Arnold.....	25	1⅜	1⅛	1⅜	....	1⅜	1⅛	1½	.....	1⅛	.....	.....	.....	1,095
Ash Bed.....	25	.50	....	.90	....	93/4	.75	....	....	.50	....	.....	.....	2,450
Atlantic	25	21½	20	21⅛	20½	21⅛	21	20	19½	20½	19½	.....	.....	9,047
Bingham Con.	50	36½	35⅜	36½	32	38½	36½	38	37⅜	38	37½	.....	.....	19 797
Bonanza.....	10	1⅜	....	1⅜	1	1⅞	1	112½	.95	1⅜	1	.....	.....	6,410
Boston Con.....	5	7⅞	7⅞	7⅞	7⅞	7⅞	7⅞	7⅞	7⅞	7⅞	7⅞	.....	.....	33,220
Calumet & Hecla .	25	700	685	700	695	695	690	690	670	685	.....	.....	.....	188
Catalpa	10	.....	.....	20	.10	.25	.20	.25	.20	.23	.20	.....	.....	11,100
Centennial.....	25	31⅛	30½	31½	30⅛	31	30	30	29⅛	30½	29½	.....	.....	7,695
Con. Mercur	5	.49	....	.47	....	.47	.45	.45	....	.45	....	.....	.....	3,500
Copper Range	100	72⅜	70⅛	74⅛	71½	74⅛	71⅛	72	71	73	71½	.....	.....	31,141
Crescent.....	10	.....	.....	.....	.....	.....	.....	10	....	12	10	.....	.....	2,000
Daly-West	100	14⅞	14	14⅞	14	15	14	14	13	14	13½	.....	.....	3,901
Dominion I. & S.	100	18½	18	18	17½	19	17⅜	.....	.....	18	17⅜	.....	.....	1,330
Elm River	100	3¼	3⅛	3⅜	....	3⅜	....	3⅜	3⅛	3⅜	3⅛	.....	.....	765
Franklin.....	12	15	14½	14⅞	13½	13⅞	....	14	13	13⅞	12⅞	.....	.....	1,720
Granby Con.....	25	5⅛	4	5⅜	5	5⅞	5	5⅜	5⅜	5⅛	5	.....	.....	101,532
Greene Con. C....	10	25⅜	25	25⅞	25	26⅛	25⅜	26⅛	25⅛	28⅛	27	.....	.....	16,378
Guanajuato Con..	10	2⅞	2 1/16	2¼	2⅜	3	2¼	3	2 1/16	3	2⅛	.....	.....	5,065
Humboldt.....	5	1⅞	....	1⅞	1¼	1⅞	....	.....	.....	.....	.....	.....	.....	660
Isle Royal Con...	25	32⅜	30½	32	30½	32	31	31½	30½	31½	30½	.....	.....	7,725
Mass Con..	25	7¼	7¼	7⅜	7	7⅜	7	7⅜	7	8⅛	7¼	.....	.....	5,295
Mayflower.....	25	1⅛	....	1⅛	1⅛	1⅛	....	1⅛	1⅛	1⅛	....	.....	.....	580
Michigan.....	25	10½	10¼	10⅜	10	10	....	10	....	10⅛	10	.....	.....	990
Mohawk	25	56	54⅜	57	55½	57⅜	56	56½	55½	55⅝	55	.....	.....	9,856
Mont. Coal & C ..	25	.....	.....	4½	....	4⅜	....	.....	.....	5	....	.....	.....	480
Old Colony.....	25	2⅛	2	2	....	2	....	.....	.....	2	....	.....	.....	460
Old Dominion ...	25	28¼	26⅞	28¼	27½	28⅜	27½	28	27½	28	27½	.....	.....	6,419
Osceola	25	98	95	97	96½	97	95⅞	95	94½	98	95½	.....	.....	2,205
Parrot.....	25	33	32	33	32½	33½	32⅜	32½	32½	32½	31¼	.....	.....	3,512
Phœnix Con.	10	4½	4¼	4½	4¼	4½	....	4	....	4½	4	.....	.....	1,560
Quincy	25	121	118	122	120	125	124	123	120	120	....	.....	.....	640
Rhode Island....	25	3	....	2⅜	....	2⅜	2½	....	....	2⅜	....	.....	.....	688
Santa Fe.....	25	3⅛	3	3⅛	2⅞	3	2⅞	3	2½	2⅜	....	.....	.....	3,000
Shannon.....	10	8⅛	7⅞	8	7⅞	8	7⅞	7⅞	7⅞	9 1/16	7⅞	.....	.....	24.315
Tamarack.....	10	140	137	139	....	138	....	.....	.....	136	....	.....	.....	503
Tecumseh	25	2½	....	2½	2½	2½	2	2½	....	2⅜	2½	.....	.....	1,245
Tennessee	25	.....	.....	.....	.....	39¼	39½	.....	.....	4⅛	....	.....	.....	200
Trinity	25	17⅛	15⅜	17	16⅜	17	15⅞	16⅛	15⅜	16	15⅞	.....	.....	36,977
Union.....	25	.....	.....	.....	.....	.....	.....	4½	....	4⅜	....	.....	.....	70
United States....	.....	24⅜	24	24⅜	24⅛	24⅞	24⅛	24⅜	24⅛	25	24⅞	.....	.....	43,193
U.S.Coal & Oil...	25	11⅞	11½	12⅛	11½	12⅛	12	12⅛	12⅛	12⅛	....	.....	.....	7,710
Utah Con	5	46⅛	44⅜	46⅜	45⅛	47	46	46⅜	45⅝	46⅛	45⅝	.....	.....	30,215
Victoria.....	25	6½	6	6½	5⅞	6	5½	5⅝	5⅛	6	5⅞	.....	.....	1,760
Washington.....	25	.90	.85	.90	....	.90	.75	....	....	.76	....	.....	.....	830
Winona.....	25	12⅜	12	12⅛	11⅜	12	11½	11⅜	11½	12	11⅜	.....	.....	3,456
Wolverine.....	25	109	107	109	107½	109	....	108	107	109	107	.....	.....	1.019
Wyandot	25	2⅞	2⅜	2⅞	2⅛	2⅛	2⅜	2⅛	....	2⅛	2⅜	.....	.....	1,598

Total sales, 530,164 shares. * For quotations see next issue.

COAL, IRON AND INDUSTRIAL STOCKS.

Company.	Par val.	Nov. 16 H.	Nov. 16 L.	Nov. 17 H.	Nov. 17 L.	Nov. 18 H.	Nov. 18 L.	Nov. 19 H.	Nov. 19 L.	Nov. 21 H.	Nov. 21 L.	§ Nov. 22 H.	§ Nov. 22 L.	Sales.
Allis-Chalmers ...	$100	16½	15½	16½	16	21	16½	21	20	21⅜	20½	.....	.....	21,000
Allis-Chalmers pf.	100	61	.....	.....	.....	66	61	69	66	70	68½	.....	.....	7,300
Am. Agri. Chem ..	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Am. Sm. & Ref. ..	100	79⅛	78⅜	80½	78½	80⅛	79⅞	79⅛	79	81⅜	79½	.....	.....	90,690
Preferred	100	114½	114	115	114	115	114½	115	114½	114½	.....	.....	.....	6,050
†Cambria Iron ...	50	.....	.....	.....	.....	.....	.....	47½	47	47⅛	.....	.....	.....	89
†Cambria Steel...	50	25⅛	25½	25⅛	25½	25⅝	25⅜	25⅛	25½	25½	25½	.....	.....	4,099
Col. Fuel & Iron..	100	47	45½	48⅛	45½	48⅛	46⅜	47⅛	46½	47⅛	46⅜	.....	.....	70,750
Col. Fuel & Iron pf	100	.....	.....	.....	.....	.....	.....	.....	85	.....	.....	.....	.....	100
Col. & H. C. & I ..	100	16	....	15½	15⅜	16	15½	16	.....	.....	.....	.....	.....	1,200
General Chem. pf..	100	.....	.....	.....	.....	97½	.....	.....	.....	.....	.....	.....	.....	200
†Lehigh C. & N...	50	92	87½	95½	94	97½	95	97	96½	96⅜	95	.....	.....	9,631
*Mong. R. Coal...	50	12	11½	.....	.....	11	.....	11½	10½	.....	.....	.....	.....	342
Preferred	50	32½	30⅞	31½	29⅜	31	30½	.....	.....	30½	30	.....	.....	1.74 7
National Lead ...	100	25	24⅛	24⅝	24¼	24⅛	24¼	24⅛	24	24⅜	24⅛	.....	.....	2,810
Preferred	100	98	97⅛	98	.....	98	97⅛	.....	.....	97½	.....	.....	.....	650
Phila. Nat. Gas..	50	41	40½	41	40½	41⅛	41	41	40½	41	40½	.....	.....	5,172
Preferred	50	46	45½	46	45½	46	....	45½	....	45½	....	.....	.....	465
*Pittsburg Coal ..	100	21½	20½	21½	20½	.....	.....	21½	21½	22	21	.....	.....	5,249
Preferred	100	78½	77½	78	77½	.....	.....	78½	.....	78⅜	78	.....	.....	2,735
Republic I. & S ..	100	16½	16½	16⅝	16	17	16⅜	17	16½	17	16⅛	.....	.....	15,010
Preferred	100	65	64	66	63⅜	67½	66	69	68	69	68	.....	.....	12,750
Sloss-Shef. S. & I .	100	62½	....	65	63	64	62½	.....	.....	63½	63	.....	.....	4,100
Preferred	100	.....	.....	.....	.....	99½	.....	.....	.....	100	.....	.....	.....	500
Standard Oil.....	100	635	622	630	623	‡630	625	628	.....	628	624	.....	.....	294
Tenn. C. I. & R.R.	100	75½	73⅞	77½	72½	77½	75½	76	75½	76⅝	75½	.....	.....	51,735
U. S. Steel Corp ..	100	27⅞	27	27⅛	26⅜	28	27	27⅛	26⅞	28⅛	27⅛	.....	.....	302,525
Preferred	100	87¾	86⅛	88	86⅛	88⅛	87½	88⅛	87½	89⅛	87½	.....	.....	337,361
Va.-Car. Chem....	100	42	41½	42½	41½	43	42	42	41½	42½	41	.....	.....	10,395
Preferred	100	113	....	113½	113	113½	113½	113	....	113½	....	.....	.....	1.355

*Pittsburg Exchange; †Philadelphia Exchange; all others, New York Stock Exchange.
§ For quotations see next issue. ‡Ex-dividend. Total sales, 966,304 shares.

STOCK QUOTATIONS.

SAN FRANCISCO.*

Company.	Loca-tion.	Nov. 10 H.	Nov. 10 L.	Nov. 11 H.	Nov. 11 L.	Nov. 12 H.	Nov. 12 L.	Nov. 14 H.	Nov. 14 L.	Nov. 15 H.	Nov. 15 L.	Nov. 16 H.	Nov. 16 L.	Sales.
MacNamara	Nev	.23	.22	.22	....	.23	.22	.24	.23	.28	.27	....	....	39,350
Mont. Tonopah	Nev	192½	1.90	....	....	1.90	....	1.90	187½	1.85	1.80	....	....	3,600
Ton. Belmont	Nev	.77	....	.77	....	.75	.74	.74	.74	.70	.68	....	....	2,950
Ton. Midway	Nev	.39	....	....	....	.39	.37	.38	....	.37	.36	....	....	9,800
Ton. Mg. Co	Nev	....	....	....	....	9.25	....	....	....	9.00	....	....	....	200
Ton. North Star	Nev	.20	.17	.17	....	....	....	.16	....	.18	.17	....	....	12,500

*San Francisco & Tonopah Exchange. Total sales, 68,400 shares.

SAN FRANCISCO (By Telegraph).

Company.	November. 21	November. 22	Company.	November. 21	November. 22
Belcher	$0.21	....	Gould & Curry	$0.13	....
Best & Belcher	1.10	....	Hale & Norcross	.73	....
Caledonia	.49	....	Mexican	1.10	....
Challenge Con.	.13	....	Ophir	2.20	....
Chollar	.13	....	Overman	.13	....
Confidence	.85	....	Sierra Nevada	.18	....
Con. California & Virginia	1.80	....	Union Con	.56	....
Crown Point	.16	....	Yellow Jacket	.17	....

COLORADO SPRINGS (By Telegraph).

Company.	Nov. 21 H.	Nov. 21 L.	Nov. 22 H.	Nov. 22 L.	Company.	Nov. 21 H.	Nov. 21 L.	Nov. 22 H.	Nov. 22 L.
Anaconda	.12	.10	....	....	Jack Pot	.03½	....	....	....
C. K. & N.	....	....	....	....	Last Dollar	....	....	....	....
Cripple Ck. Con.	.12½	.12½	....	....	Mollie Gibson	.04½	.03½	....	....
Doctor Jack Pot	.04½	.04½	....	....	Moon Anchor	.06½	.05½	....	....
Elkton Con	.68	.67½	....	....	Old Gold	.08½	.08½	....	....
El Paso	1.14½	1.14½	....	....	Pharmacist	.03½	.03½	....	....
Gold Dollar	.06½	.06½	....	....	Portland	1.77	1.70	....	....
Gold Sovereign	.06½	.06½	....	....	Vindicator Con	.68	....	....	....
Isabella	.20	.19½	....	....	Work	.09	.08½	....	....

ST. LOUIS, MO.* Nov. 19.

Company.	Par Val.	Bid.	Ask.	Company.	Par Val.	Bid	Ask.
Am. Nettie, Colo	$10	$0.20	$0.30	Columbia Lead, Mo.	$10	$0.25	$1.00
Center Creek	10	1.00	2.00	Con. Coal, Ill	100	12.50	17.50
Central Coal & C.	100	61.50	64.00	Doe Run Lead, Mo.	100	110.00	115.00
Central C. & C., Pf	100	70.00	72.00	Granite Bimet., Mont.	10	.30	.45
Central Lead, Mo.	100	110.00	115.00	St. Joe Lead, Mo	10	14.00	16.00

*By our Special Correspondent.

DULUTH, MINN.

Company.	Par Val.	Bid.	Ask.	Company.	Par Val.	Bid.	Ask.
Black Mountain	$1	$1.25	$1.35	Lake Sup. & Pitts	$10	$50.50	$51.00
Calumet & Arizona	10	102.00	105.00	Pitts. & Duluth	15	78.50	80.00
Calumet & Bisbee	10	....	2.00	Shakespeare	1	....	.20
Calumet & Pittsburg	10	41.00	42.00	United Mexican	10	....	.25
Junction Development	15	68.00	70.00	Wolverine & Arisona	10	....	1.50

MONTREAL.* Nov. 18.

Company.	Par Val.	High	Low	Sales	Company.	Par Val.	High	Low	Sales
Dominion Coal	100	65.00	62.50	780	Montreal Steel	100	....	....	....
Dom. Coal, Pf	100	115.00	114.00	34	Mont'l Steel, Pf	100	95.00	....	11
Dom. I. & St	100	19.25	17.87½	6,825	Nova Scotia St.	100	69.25	67.00	1,175
Dom. I. & St., Pf.	100	49.00	48.25	280	N. S. Steel, Pf	100	108.00	....	20

*Montreal Stock Exchange. Total sales, 9,125 shares.

MEXICO. Nov. 11

Company.	Shares Issued	Prices, Mex. Bid.	Prices, Mex. Ask.	Company.	Shares Issued	Prices, Mex. Bid.	Prices, Mex. Ask.
DURANGO:				Soledad, aviada	$670	$1,380	$1,400
Ca. Min. de Penoles	2,500	$2,600	$3,000	Sorpresa, aviada	960	330	350
San Andres de la Sierra	200	10,000	....	MEXICO:			
GUANAJUATO:				Aldebarren	2,000	55	58
Cinco Senores y An. aviadoras	2,000	32	36	Buen Despacho	3,000	70	80
Cinco, Senores y An. aviada	400	32	36	Dos Estrellas	3,000	3,040	3,100
Providencia, San Juan de la Luz	6,000	165	172	La Esperanza (El Oro)	3,000	1,500	1,500
GUERRERO:				Santa Ana, Esperanza	2,400	15	30
Garduno y Anexas	7,200	30	35	NUEVO LEON:			
HIDALGO:				La Fraternal	1,000	580	620
Amistad y Con	9,600	70	73	Norias de Bajan	1,000	500	600
Carmen, aviada	1,100	220	240	SAN LUIS POTOSI:			
Guadalupe Fresnillo Mill	1,000	170	200	Concepcion y An	3,000	50	70
Guadalupe Fresnillo Mine	1,400	70	80	El Barreno, aviadora	2,000	83	86
Maravillas y An., aviador	1,680	90	110	Sta. Maria de la Paz	9,600	231	233
Maravillas el Lobo	1,000	130	180	ZACATECAS:			
Refugio, aviada	12,800	5	7	Asturiana y An	2,500	16	21
Sta. Gertrudis y An. aviadas	9,600	10	12	Candelaria y Pinos	2,500	35	40
Sta. Gertrudis y An. aviadora	28,800	77	79	San Carlos y Annexas	2,500	35	40
San Rafael y An., Trompillo	1,200	2,400	2,500	Sta. Maria de Gaud	2,500	88	90
San Rafael y An., aviada	1,200	845	860	MISCELLANEOUS:			
				Bartolome de Medina	2,000	99	102
				Naica (Chihuahua)	100	11,000	13,000
				Natividad (Oxaca) aviadora	1,800	95	100
				San Francisco Hac.	6,000	83	85
				Union Hacienda	3,000	375	385

LONDON. Nov. 11

Company.	Shares Issued.	Par value.	Latest dividend. Amt.	Latest dividend. Date.	Quotations. Buyers.	Quotations. Sellers.
American:		£ s. d.	s. d.		£ s. d.	£ s. d.
Alaska-Treadwell	200,000	5 0 0	4 0	Oct., 1904	4 15 0	5 0 0
Anaconda	1,200,000	5 0 0	2 0	Nov., 1904	5 13 9	5 16 3
*Camp Bird	820,000	1 0 0	9	Nov., 1904	1 8 6	1 9 0
Copiapo	112,500	2 0 0	5 0	Oct., 1904	1 0 0	1 5 0
De Lamar	80,000	1 0 0	2 0	Nov., 1904	13 9	16 3
El Oro	1,080,000	1 0 0	9	July, 1904	1 1 9	1 2 11
Frontino & Bolivia	140,000	1 0 0	rts.	Mar., 1904	6 0	7 0
Le Roi	200,000	5 0 0	5 0	Nov., 1899	15 0	17 6
Le Roi No. 2	120,000	5 0 0	1 0	June, 1904	12 6	15 0
Mesquital	250,000	1 0 0	3	Feb., 1903	2 6	3 0
Palmarejo & Mexican	445,000	1 0 0	rts.	Apr., 1903	8 9	9 3
Standard	500,000	4 0	1½	Sept., 1903	1 0	2 0
Stratton's Independence	1,000,007	1 0 0	6	Dec., 1903	5 9	6 3
St. John del Rey	546,265	1 0 0	6	Dec., 1904	14 6	15 6
Tomboy	300,000	1 0 0	1 0	June, 1902	1 2 6	1 7 6
Ymir	200,000	1 0 0	1 0	Mar., 1902	2 6	5 0
European:						
Linares	15,000	3 0 0	5 0	Sept., 1904	4 0 0	4 10 0
Mason & Barry	185,172	1 0 0	7 0	May, 1904	3 2 6	3 7 6
*Rio Tinto	325,000	5 0 0	32 6	Nov., 1904	60 17 6	61 2 6
Rio Tinto, preferred	325,000	5 0 0	2 6	Nov., 1904	6 2 6	6 7 6
Tharsis	625,000	2 0 0	7 0	May, 1904	4 17 6	5 2 6
West Australian:						
Associated	495,388	1 0 0	2 6	July, 1904	1 13 9	1 16 3
Cosmopolitan	400,000	1 0 0	1 0	Apr., 1904	6 3	6 9
Golden Horseshoe	300,000	5 0 0	6 0	Nov., 1904	7 2 6	7 5 0
Great Boulder	1,750,000	2 0	9	Sept., 1904	1 0 6	1 1 0
Gt. Boulder Persever'ce	1,400,007	1 0 0	1 0	Sept., 1904	12 3	12 6
Great Fingall	250,000	1 0 0	7 0	Oct., 1904	8 2 6	8 5 0
Ivanhoe	200,000	5 0 0	5 0	Oct., 1904	7 12 6	7 15 0
Kalgurli	120,000	1 0 0	2 6	Oct., 1904	5 15 0	5 17 6
Lake View	250,000	1 0 0	1 6	Oct., 1904	1 2 11	1 4 1
Oroya-Brownhill	450,000	1 0 0	3 0	Sept., 1904	3 7 6	3 8 9
Miscellaneous:						
Brilliant Central	100,000	1 0 0	1 0	Nov., 1904	1 15 0	2 0 0
Brissis	600,000	1 0 0	....	....	11 9	12 3
Broken Hill	960,000	8 0	1 0	Nov., 1904	2 6 6	2 7 6
Mt. Lyell	1,200,000	3 0 0	1 3	June, 1904	11 6	12 6
*Mt. Morgan	1,000,000	1 0 0	3	Nov., 1904	2 7 6	2 10 0
Waihi	497,412	1 0 0	2 6	Dec., 1904	5 17 6	5 18 9
Indian:						
Champion Reef	2,000,000	10 0	1 4	Sept., 1904	1 12 9	1 13 9
†Mysore	580,000	10 0	4 6	Nov., 1904	6 8 9	6 11 3
Nundydroog	484,000	10 0	1 6	Nov., 1904	1 14 6	1 15 6
Ooregum	683,000	10 0	1 3	Aug., 1904	17 6	18 9
Ooregum, pfd	240,000	10 0	4	Aug., 1904	1 5 0	1 7 6
South African:						
Angelo	600,000	1 0 0	7 0	Aug., 1904	7 0 0	7 2 6
Bonanza	200,000	1 0 0	8 0	Aug., 1904	1 3 9	1 6 3
British South Africa	4,568,392	1 0 0	rts.	May, 1899	1 15 0	1 16 3
Cape Copper	300,000	2 0 0	2 6	July, 1904	4 11 3	4 13 9
Cape Copper, pfd	45,000	2 0 0	2 6	July, 1904	4 5 0	4 10 0
City & Suburban	340,000	4 0 0	4 0	Aug., 1904	5 12 6	5 17 6
Consol. Gold-Fields	2,000,000	1 0 0	2 6	Nov., 1904	7 8 9	7 11 3
*Crown Reef	120,000	1 0 0	18 0	Nov., 1904	15 5 0	15 10 0
De Beers, preferred	800,000	2 10 0	10 0	Aug., 1904	18 6 3	18 8 9
De Beers, deferred	1,000,000	2 10 0	12 6	Aug., 1904	18 7 6	18 10 0
East Rand	990,000	1 0 0	5 0	July, 1903	8 15 0	8 16 3
Ferreira	95,000	1 0 0	22 6	Aug., 1904	22 10 0	23 0 0
Geldenhuis	200,000	1 0 0	5 0	Aug., 1904	5 17 6	6 0 0
Geduld	400,000	1 0 0	rts.	Mar., 1902	7 3 9	7 5 0
Henry Nourse	125,000	1 0 0	8 0	Aug., 1904	8 7 6	8 12 6
Jubilee	50,000	1 0 0	5 0	Aug., 1904	4 5 0	4 10 0
Jumpers	100,000	1 0 0	2 6	May, 1904	2 2 6	2 7 6
Langlaagte	470,000	1 0 0	2 0	Aug., 1904	4 0 0	4 2 6
May	288,750	1 0 0	3 0	Aug., 1904	4 2 6	4 5 0
Meyer & Charlton	100,000	1 0 0	5 0	Aug., 1904	5 12 6	5 17 6
Modderfontein	290,000	1 0 0	rts.	Apr., 1902	10 11 3	10 13 9
Namaqua	94,331	2 0 0	2 6	June, 1904	3 7 6	3 12 6
New Jagersfontein	200,000	5 0 0	15 0	Dec., 1904	26 15 0	27 5 0
New Primrose	325,000	1 0 0	3 0	Aug., 1904	3 11 3	3 13 9
Rand	1,795,956	5 0 0	5 0	Aug., 1904	11 2 6	11 3 9
Robinson	550,000	5 0 0	6 0	Aug., 1904	10 7 6	10 12 6
Robinson Deep	950,000	1 0 0	3 0	Aug., 1904	5 10 0	5 12 6
Rose Deep	425,000	1 0 0	3 0	Aug., 1904	8 12 6	8 17 6
Salisbury	100,000	1 0 0	2 0	Dec., 1904	1 18 9	2 1 3
Village Main Reef	400,000	1 0 0	4 0	July, 1904	7 8 9	7 11 3
Wemmer	80,000	1 0 0	12 6	July, 1904	10 15 0	11 0 0

*Ex-dividend. †Ex-rights.

LONDON (By Cable).*

Company.	Nov. 16 £	Nov. 16 s.	Nov. 16 d.	Nov. 22 £	Nov. 22 s.	Nov. 22 d.	Company.	Nov. 16 £	Nov. 16 s.	Nov. 16 d.	Nov. 22 £	Nov. 22 s.	Nov. 22 d.
Camp Bird	1	9	4½	1	9	0	Esperanza	....	....	....	....	19	6
Con. Gold Fields.	7	7	6	7	7	6	Modderfontein	9	12	6	9	16	3
DeBeers	18	10	0	18	7	6	Rand Mines	11	2	6	11	2	6
Dolores	1	5	0	1	5	0	Rio Tinto	62	12	6	61	12	6
East Rand	8	16	0	8	16	3	Simmer & Jack	1	18	9	1	19	4½
El Oro	1	3	1½	1	1	3	Tomboy	1	7	6	1	6	3

*Furnished by Wm. P. Bonbright & Co., 15 Wall St., New York.

PARIS.

Company.	Location.	Capital Stock.	Par value.	Latest dividend.	Prices. Opening.	Prices. Closing.
		Francs.	Fr.	Fr.	Fr.	Fr.
Anzin, Coal	France	....	....	290.00	5,725.00	5,710.00
Boleo, c	Lower Cal.	12,000,000	500	104.17	2,245.00	2,260.00
Champ d'Or, g	S. Africa	3,375,000	25	3.75	16.75	16.75
Courrieres, Coal	France	600,000	500	110.00	2,910.00	2,949.00
Fraser River, g	Brit. Col	250,000	25	....	5.50	5.50
Huanchaca, s	Bolivia	40,000,000	125	2.50	92.75	93.75
Laurium, z. l	Greece	16,300,000	500	25.00	309.00	309.00
Malfidano, z	Italy	12,500,000	500	50.00	625.00	630.00
Metaux, Cie. Fran. de	France	25,000,000	500	22.50	510.00	505.00
Mokta-el-Hadid, i. l	Algeria	18,312,000	500	40.00	1,022.00	1,010.00
Nickel, n	N. Caledonia	15,000,000	250	22.50	639.00	610.00
Penarroya, Coal	Spain	....	500	45.00	1,130.00	1,136.50
Vielle Montagne, z	Belgium	9,000,000	30	30.00	778.00	778.00

c—Copper. g—Gold. i—Iron. l—Lead. n—Nickel. s—Silver. z—Zinc.